Warszawskie Zakłady Urządzeń Informatyki
MERAMAT

SYSTEM MERA 9150

Podręcznik serwisowy

2

WARSZAWSKIE ZAKŁADY
URZĄDZEŃ INFORMATYKI
MERAMAT

SYSTEM MERA 9150

Podręcznik serwisowy

2

WEMA – 500+25 – 805/79/F

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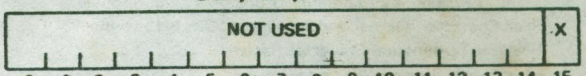
COMMUNICATIONS

COMMUNICATION CONTROLLER ACCUMULATOR CONTENT

DOA, X, 41 XMT

DOA, AC, SCT

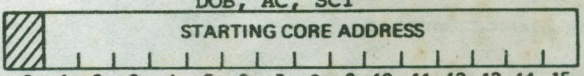


Bit 15-0 = Breaks telephone connection

Bit 15-1 = Holds telephone connection --Sets Data Terminal Ready Line to Data Set

DOB, X, 41 XMT

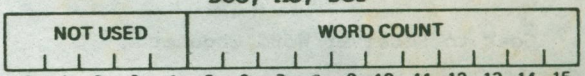
DOB, AC, SCT



Loads Address Register

DOC, X, 41 XMT

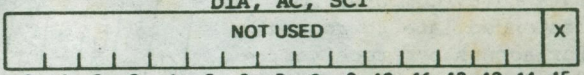
DOC, AC, SCT



Word count entered in two's complement --loads counter

DIA, X, 41 XMT

DIA, AC, SCT



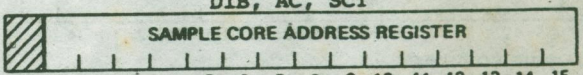
Status Word

Bit 15-0 = Normal

Bit 15-1 = Data Late -- CPU DCH responded late to request for access by xmitter.

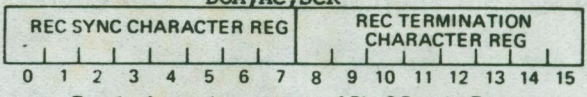
DIB, X, 41 XMT

DIB, AC, SCT



DOA, X, 40 REC

DOA,AC,SCR

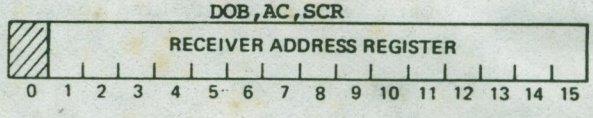


Transfer Accumulator contents of Bits 0-7 to the Receiver Sync Character Register and contents of Bits 8-15 to the Receiver Termination Character Register.

Defines SYN and EOT characters.

DOB, X, 40 REC

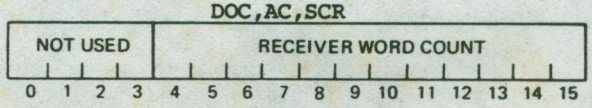
DOB,AC,SCR



Loads counter.

DOC, X, 40 REC

DOC,AC,SCR

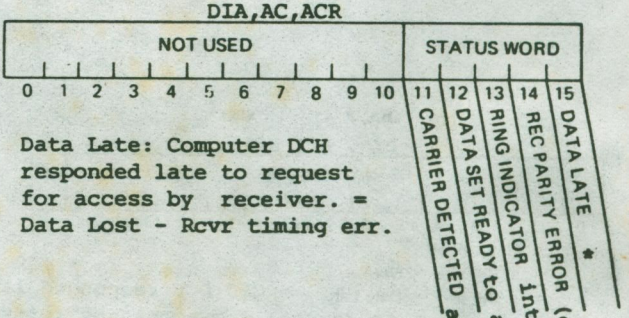


Word count is entered in two's complement form.

Goes to Receiver Word Counter

DIA, X, 40 REC

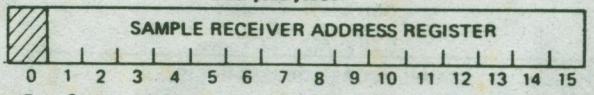
DIA,AC,ACR


NOT USED
STATUS WORD
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
DATA LATE *
REC PARITY ERROR (char)
RING INDICATOR into D.S.
DATA SET READY to accept data.
CARRIER DETECTED at D.S.

Data Late: Computer DCH responded late to request for access by receiver. = Data Lost - Rcvr timing err.

DIB, X, 40 REC

DIB,AC,ACR



Loads counter.

CONNECTOR PIN CONFIGURATION

Computer Backpanel	Signal Name	19-Pin Connector on Jumbo Frame (Cannon 2DE19S)	25-Pin Modem (EIA) Connector
GND	Protective Ground	1	1
B53	Transmitted Data	2	2
B52	Received Data	3	3
B69	Request To Send	4	4
B54	Clear To Send	5	5
B40	Data Set Ready	6	6
GND	Signal Ground	7	7
B38	Carrier Detect	8	8
B67	Internal Clock	11	(n/c)
B34	Serial Clock Transmit	15	15
B51	Serial Clock Receiver	17	17
B49	Data Terminal Ready	18	20
B36	Ring Indicator	19	22

TEST PLUG JUMPERS

A/B/C	B53-B52	Xmit Data - Rcve Data
A/B	B49-B51	DTR - Rcve Clk
	B51-B34	Rcve Clk - Xmit Clk
	B34-B38	Xmit Clk - Carr Det
A/B/C	B69-B54	RTS -- CTS
	B54-B40	CTS -- DSR
	B40-B36	DSR -- Ring Indic
C	B67-B51	Int Clk -- Rcve Clk
	B51-B34	Rcve Clk -- Xmit Clk
	B34-B38	Xmit Clk -- Carr Det

COMMUNICATION PROCEDURES FOR SYSTEM TO SYSTEM OPERATIONS

1. Display Supervisor's Help List
2. Select 'C' – Utility–Operations
3. Select 'I' – Communications Utilities

Tape To Communications

1. Select 'E' – Tape to Communications
2. Select Tape Unit (A)
3. Enter Code Set (Hit Field Release)
4. Hit Release

Tape From Communications

1. Select 'C' – Tape from Communications
2. Select Tape Unit (A)
3. Enter Code Set (Hit Field Release)
4. Hit Release

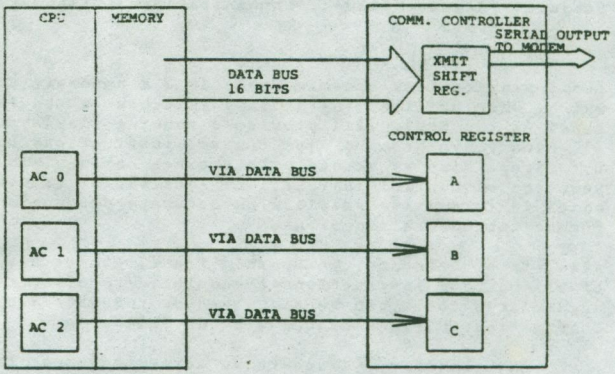
Printer From Communications

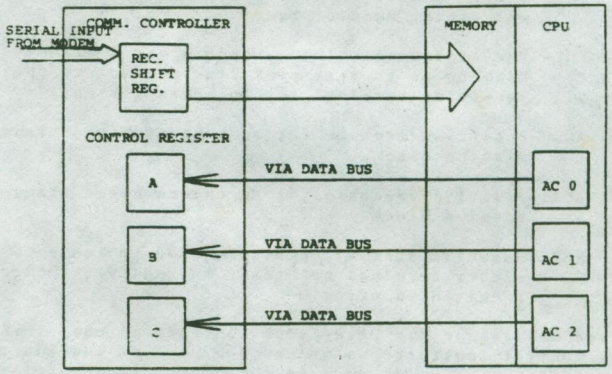
1. Select 'A' – Printer from Communications
2. Hit Release

To Abort:

Hit PGM–Help. When No. xxxx (No. of Records) is displayed, hit Release. (This message will appear after any type of disconnect.)

For further operational detail, refer to the OPERATIONS MANUAL, Ord. No. S-14, Marketing, pages 4-9 to 4-23.


CPU
MEMORY
COMM. CONTROLLER
SERIAL OUTPUT
TO MODEM
XMIT
SHIFT
REG.
DATA BUS
16 BITS
CONTROL REGISTER
AC 0
VIA DATA BUS
A
AC 1
VIA DATA BUS
B
AC 2
VIA DATA BUS
C


SERIAL INPUT
FROM MODEM
COMM. CONTROLLER
REC.
SHIFT
REG.
MEMORY
CPU
CONTROL REGISTER
A
VIA DATA BUS
AC 0
B
VIA DATA BUS
AC 1
C
VIA DATA BUS
AC 2

Subject: Release S580-1, Communications, Diagnostic Tool

The Communications Dynamic Trace is a diagnostic tool which, when utilized (by setting switches on the front panel of the CPU), will provide a running display of all binary synchronous line control instructions on the Data/Scope display screen. This trace makes visible the sequence of control instructions received or transmitted, which in turn makes possible an accurate diagnosis of communications malfunctions.

Also, in addition to the Dynamic Trace, counters are kept of all control instructions transmitted/received; these accumulated tools can be displayed on the Data/Scope. Control instructions traced are the following:

ENQ- Enquiry. Requests an acknowledgement of a transmitted block, or asks if ready to receive.

TXT- Text. Indicates that a transmission block was either sent or received.

EOT- End of Transmission. Used to end a transmission or to turn over line control to the receiving terminal for acknowledgement.

ACK0-Positive response for an even-numbered transmission block.

ACK1-Positive repsonse for an odd-numbered transmission block.

NAK- Negative acknowledgement. Used to indicate either terminal not ready to receive or block received in error.

A trace message on the Data/Scope consists of one of the above control instructions preceded by a T if the instruction is TRANSMITTED, or an R if the control instruction is RECEIVED.

Dynamic Trace

If bit 0 (left-most switch on the CPU front panel) is set, characters which identify instructions currently active on the line are displayed. For example, a normal sequence seen on the transmitting system might be as follows:

TENQ RACK0 TTXT RACK1 TTXT RACK0, etc.

On the receiving unit, the same sequence would appear as follows:

RENQ TACK0 RTXT TACK1 RTXT TACK0, etc.

Upon attempting to call an ENTREX system on an Auto-Answer modem, if the receiving unit were not set up to receive, the following sequence would occur:

TENQ RNAK TENQ RNAK, etc.

The received acknowledgement indicates an established connection to a system not ready to receive. If an attempt to communicate is made, but no answer is received on that modem, the following would be displayed:

TENQ TENQ TENQ TENQ, etc.

The following instruction sequence is the receiving unit's trace display for a block received in error and retransmitted correctly:

RTXT TACK1 RTXT TNAK RTXT TACK1, etc.

Accumulative Display

If bit 15 (right-most switch on the CPU frontpanel) is set, accumulative totals of the line transactions are kept. For example:

	ENQ	TXT	EOT	ACK0	ACK1	NAK
T	2			1	1	
R	1	1	1			

ARQ An automatic system which provides error correction by utilizing a constant ratio code and a closed loop to request retransmission of mutilated characters as indicated by receipt of nonconstant ratio characters.

ASCII American Standard Code for Information Interchange, usually pronounced "Askee". An 8-level code for data transfer proposed to achieve compatibility between data devices.

ASR Automatic send/receive—A teleprinter unit with keyboard, printer, paper tape reader and paper tape punch, which allows tape to be produced and edited off line for automatic transmission.

ALPHANUMERIC Capable of representing the alphabet as well as the decimal digits 0-9 and (usually) a group of miscellaneous symbols.

ASYNCHRONOUS Having a variable time interval between successive bits, characters or events.

BAUD The reciprocal of the minimum time interval (in seconds) in a serial data transmission system; loosely, bits per second.

BAUDOT CODE The conventional 5-level teletypewriter code with provision for character interpretation alternatively as letters or figures.

BINARY Having two states, 0 and 1, represented by two discrete voltage or current levels.

BIT The basic unit of information in an on-off (two state) system.

BIT STREAM Referring to a binary signal without regard to groupings by character.

BUFFER A system component which permits a change of speed, voltage, or interface characteristic; frequently presumed to include storage capability.

CDC Call Directing Code—Two or three character code used to route automatically a message or command.

CHARACTER A numeric digit, alphabetic letter or special symbol.

CHARACTER SET Comprises the numbers, letters, and symbols associated with a given device or coding system.

CHARACTERISTIC DISTORTION The normal and predictable distortion of data bits produced by characteristics of a given circuit at a particular transmission speed.

CIRCUIT SWITCH A communications switching system which completes a circuit from sender to receiver at the time of transmission (as opposed to a message switch).

CLOCK A source of precisely-spaced timing pulses.

CODE A specific way of grouping bits to represent a given alphabet or character set.

CODE CONVERSION A process for changing the bit groupings for characters in one code into the corresponding character bit groupings for a second code.

COMPATIBLE Capable of direct interconnection; usually implies no requirement for code, speed, or signal level conversion.

CONSTANT RATIO CODE A code in which all characters are represented by combinations having a fixed ratio of ones to zeroes.

CONTROL CHARACTER A character used to cause functions such as line feed, carriage return, etc., to occur.

DUPLEX Relates to a communications system or equipment capable of transmission in both directions (see half duplex; full duplex).

EIA INTERFACE A set of signal characteristics (time duration, voltage and current) specified by the Electronic Industries Assn.

ELEMENT Synonymous with bit as the minimum subdivision within a code grouping representing a character.

ERROR RATE A measure of quality of circuit or equipment; the number of erroneous bits or characters in a sample, frequently taken per 100,000 characters.

FSK Frequency shift keying in which two possible states (one and zero) are transmitted as two separate frequencies.

FIELDATA CODE The U. S. Military code used in data processing as a compromise between conflicting manufacturers' codes.

FIGURE SHIFT A control character in the Baudot code after which characters are interpreted as belonging to the grouping containing numerics, punctuation and special symbols (upper case).

FOUR-ROW KEYBOARD Used for origination of 8-level codes eliminating the need for figures/letters case shifts.

FOUR-WIRE SYSTEM A system in which the transmitting and receiving paths are carried on two separate two-wire circuits.

FRAMING The process of selecting the bit groupings representing one or more characters from a continuous stream of bits.

FRAMING BITS Non-information carrying bits used to make possible the separation of characters in a bit stream.

FREQUENCY DIVISION MULTIPLEX (FDM) A system of transmission in which characters or bits belonging to separate messages modulate a series of separate carriers transmitted simultaneously on a single circuit.

FULL DUPLEX Refers to a communications system or equipment capable of transmission simultaneously in two directions.

FULL SPEED Referring to transmission of data in teleprinter systems at the full rated speed of the equipment.

HALF DUPLEX (HDX) Refers to a communication system capable of transmission alternately but not simultaneously in two directions.

HALF SPEED Referring to transmission of data in teleprinter systems at half the rated speed of the associated equipment.

HEADER The initial characters of a message designating addressee, routing, time of origination, etc.

HOLLERITH CODE The 12-unit code used in conventional punched tabulating machine cards.

INFORMATION BIT One of those bits which are used to specify the characters of a given code group (opposed to framing bits).

INTERFACE The electrical and operational characteristics of the input and output of a device or equipment.

KSR Keyboard send/receive—A teleprinter unit with keyboard and printer.

LEASED CHANNEL A point-to-point channel reserved for sole use of a single leasing customer.

LETTERS SHIFT A control character in the Baudot code after which all characters are interpreted as belonging to the group containing letters (lower case).

LEVEL In describing codes or characters, synonymous with bit and element.

LINE HIT An electrical interference causing the introduction of spurious signals on a circuit.

LINE COORDINATION The process of insuring that equipment at both ends of a circuit are set up for a specific transmission.

LINE PRINTER A printer in which all characters across an entire line of type are printed in one printing cycle.

LINE SPEED The maximum rate at which signals may be transmitted over a given channel; usually in baud or bits/sec.

LOCAL LOOP That part of a communication circuit from the subscriber's equipment to the line terminating equipment in the exchange (either 2-wire or 4-wire).

LOGICAL ONE OR ZERO "Computerese" for the two possible states of binary systems (equivalent to mark or space).

MARGIN The percentage of an element length by which the transitions defining the element may vary from their nominal positions.

MARK One of the two possible conditions of an element (bit); a closed line in a neutral circuit.

MESSAGE A group of characters having meaning as a whole and always handled as a group.

MESSAGE SWITCH A term for one of the routing points in a store and forward switching system.

MODEM Modulator/demodulator used to transmit and receive communications signals on a carrier.

MULTIPLEX Any means of placing two or more separate transmissions on one channel.

NEUTRAL KEYING Form of telegraph signal which has current either on or off in the circuit with "on" as mark, "off" as space.

OPM Operations per minute; equivalent to characters per minute when control functions are included.

OFF-LINE Not directly connected to the principal communication circuit or data processing equipment.

ON-LINE Directly connected to the principal communication circuit or data processing equipment.

PAGE PRINTER A printer printing characters one at a time in page format.

PARALLEL Reference to a system in which the elements defining a character occur simultaneously upon a number of lines.

PARITY CHECK Addition of non-information bits to data, making the number of ones in a grouping of bits either always even or always odd. This permits detection of bit groupings which contain single errors. It may be applied to characters, blocks, or any convenient bit grouping.

POLAR KEYING Form of telegraph signal in which circuit current flows one direction for marking, the other for spacing.

PRIVATE LINE A circuit reserved solely for one user.

QUARTER-SPEED Refers to transmission of data in teleprinter systems at one fourth the rated speed of the associated equipment.

ROPP Receive Only Page Printer—A teleprinter unit with printer only for stations which do not generate messages.

ROTR Receive Only Typing Reperforator—A paper tape punch which also types the received character on the edge of the tape.

RT Reperforator/Transmitter—An integrated unit consisting of paper tape punch and paper tape reader for temporary storage of traffic for retransmission.

REPEATER A system component which reconstitutes signals into standard voltages, currents, and timing.

REPERFORATOR A paper tape punch.

SERIAL A reference to a system in which the elements defining a character occur sequentially upon a single line.

SIMPLEX Loosely, a communications system or equipment capable of transmission in one direction only.

SIMULTANEOUSLY Occurring at substantially the same instant of time. To be meaningful, the minimum time interval to be considered must be specified.

SOLID STATE Utilizing transistors, diodes, and passive components only; excludes tubes, relays, and other electromechanical devices.

SPACE One of the two possible conditions of an element (bit); an open line in a neutral circuit.

START ELEMENT The first element of a character in certain serial transmissions, used to permit synchronization.

STATION BATTERY The electrical power source for signalling in telegraphic systems.

STOP ELEMENT The last element of a character in certain serial transmissions, used to insure recognition of next start element.

STORE & FORWARD Applied to communication systems in which messages are received at intermediate routing points and recorded (stored). They are then retransmitted to a further routing point or to the ultimate recipient.

STUNT BOX A device used to recognize CDC's, form automatic answers, turn on printers, etc.

SUPERVISORY CONTROL SIGNALLING Characters or signals which automatically actuate equipment or indicators at a remote terminal.

SYNCHRONOUS Having a constant time interval between successive bits, characters, or events.

TD Transmitter-Distributor — Electromechanical unit to transform characters in punched paper tape to serial electrical impulses.

TEX Telex.

TTY Teletypewriter equipment.

TWX AT & T teleprinter subscription service, much the same as telephone ,networks for telephone subscribers.

TELEX International network of teleprinter subscriber service; also a domestic Western Union network.

THREE-ROW KEYBOARD Utilized for transmission of 5-level codes and requiring figures/letters shifts.

TIME DIVISION MULTIPLEX A system of transmission in which characters or bits belonging to separate messages appear at successive times on a single circuit.

TRANSITION The instance of switching from one state (e.g., positive voltage) to a second state (negative) in a serial transmission.

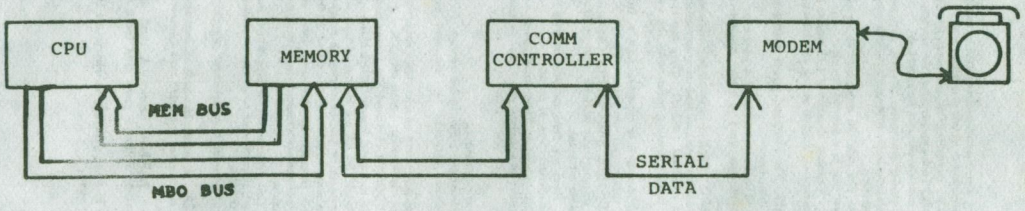
TRANSLATERS Code conversion devices which may generate a character sequence in response to a single character, e.g., $ = dlrs.

TRUNK Circuit(s) between two exchanges as opposed to local loops.

TWO-WIRE SYSTEM A system in which all communication transmitted or received is carried over a two-wire circuit or equivalent.

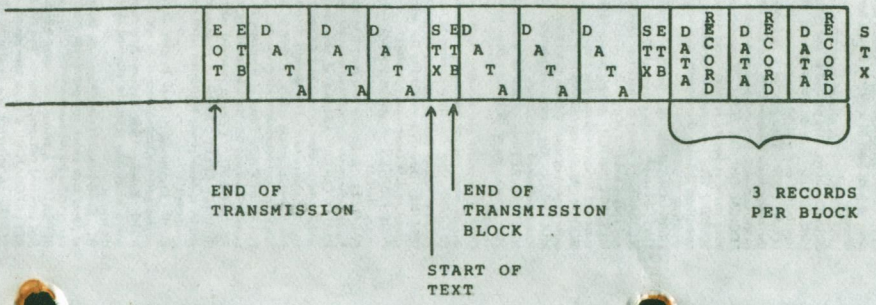
WATS Wide Area Telephone Service—A tariff and system allowing calling within a given area for a set monthly charge.

WPM Words Per Minute; generally six characters (including space) per word.



16 BIT PARALLEL

MESSAGE FORMAT



EBCDIC

Bit Positions 4,5,6,7		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
	Hex	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL	DLE	DS		SP	&	-						(	)	\	0
0001	1	SOH	DC1	SOS						a	j	~		A	j		1
0010	2	STX	DC2	FS	SYN					b	k	s		B	K	S	2
0011	3	ETX	DC3							c	l	t		C	L	T	3
0100	4	PF	RES	BYP	PN					d	m	u		D	M	U	4
0101	5	HT	NL	LF	RS					e	n	v		E	N	V	5
10	6	LC	BS	EOB / ETB	UC					f	o	w		F	O	W	6
0111	7	DEL	IL	PRE / ESC	EOT					g	p	x		G	P	X	7
1000	8		CAN							h	q	y		H	Q	Y	8
1001	9	RLF	EM						\	i	r	z		I	R	Z	9
1010	A	SMM	CC	SM		¢	!	|	:							
1011	B	VT				.	S	,	'								
1100	C	FF	IFS		DC4	<	*	%	@								
1101	D	CR	IGS	ENQ	NAK	(	)	–	'								
1110	E	SO	IRS	ACK		+	;	>	=								
1111	F	SI	IUS	BEL	SUB	¦	¬	?	"								

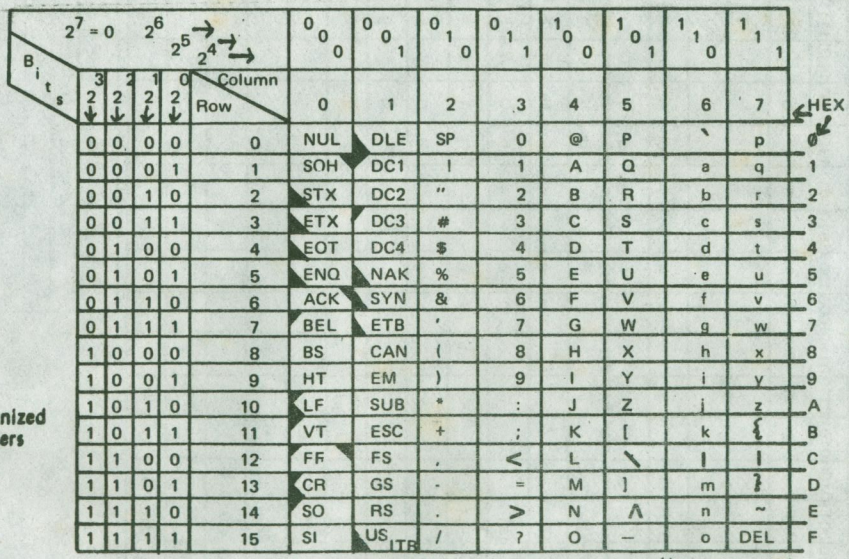
Duplicate Assignment

CONTROL CODES

Data Link Character	Control Code Chart	
	EBCDIC	USASCII
SYN	nc	nc
SOH	nc	nc
STX	nc	nc
ETB	EOB(ETB)	nc
ETX	nc	nc
EOT	nc	nc
ENQ	nc	nc
ACK 0	DLE	DLE 0
ACK 1	DLE /	DLE 1
NAK	nc	nc
DLE	nc	nc
ITB	IUS	US
WACK	DLE ,	DLE ;
RVI	DLE @	DLE <
TTD	STX ENQ	STX ENQ
DISCONN	DLE EOT	DLE EOT

nc – no change

USASCII CODE



Bits 3 ↓	2 ↓	1 ↓	0 ↓	Row \ Column	0 (000)	1 (001)	2 (010)	3 (011)	4 (100)	5 (101)	6 (110)	7 (111)	HEX
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p	Ø
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q	1
0	0	1	0	2	STX	DC2	"	2	B	R	b	r	2
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s	3
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t	4
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u	5
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v	6
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w	7
1	0	0	0	8	BS	CAN	(	8	H	X	h	x	8
1	0	0	1	9	HT	EM	)	9	I	Y	i	y	9
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z	A
1	0	1	1	11	VT	ESC	+	;	K	[	k	{	B
1	1	0	0	12	FF	FS	,	<	L	\	l	|	C
1	1	0	1	13	CR	GS	-	=	M	]	m	}	D
1	1	1	0	14	SO	RS	.	>	N	^	n	~	E
1	1	1	1	15	SI	US ITB	/	?	O	—	o	DEL	F

CONTROL CODES * | STANDARD | OPTIONAL

Indicates control codes recognized by Centronics printers

480 USES

* 480 ALLOWS

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RELEASE

5

DIAGNOSTICS

RELEASE V DIAGNOSTIC

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Abstract

MEM02 is a maintenance and test program designed to produce worst case noise conditions on the sense/inhibit wires. The program should be run to insure proper operation of sense amplifiers, inhibit drivers, and memory circuits.

Operating Procedure

1. Use loading procedure to read diagnostic.
2. Program comes up running and prints the following message:

   MEMORY CHECKER 111 8K REV 7
   DIAGNOSTIC RELEASE 3
   LAST LOCATION TESTED 077777
3. Switch settings may be activated after the program is read into the processor.

Switch Settings

Switch 0 (0) = Normal error reporting
Switch 0 (1) = Halt on error
Switch 8 (0) = Normal
Switch 8 (1) = 1024 read/write disturbs
Switch 15 (0) = Normal error reporting
Switch 15 (1) = Type letter "E" and continue

Error Description

The program will halt and the following information will be present in the accumulators.

AC0 = Goodword
AC1 = Error word

AC2 = Error address
AC3 = Address of relocated program

If switch 15 is set to 1 (scoping mode). the program will print an "E" at the occurrence of each error and will continue running.

Restart Location – 1000_8.

Miscellaneous

The time for one pass depends upon the amount of memory that is installed in the system. With 32K of memory 5 min should be sufficient to check memory enough to find all errors.

CPU TEST – CPUØ8

ABSTRACT:

CPUØ8 is a diagnostic program written to test the logic and reliability of the CPU.

CPUØ8 has 4 sections:

1. LOGIC – gate by gate test of the instruction set
2. EXERCISER – test of reliable operation of the instructions
3. ARITHMETICS – test of the logical and arithmetic instructions. This section relocates itself to various parts of available memory.
4. POWER – tests the power-fail logic and the auto restart feature

OPERATION

1. Load CPUØ8 into memory
2. CPU will halt at 1003
3. Set switches and depress CONTINUE
4. Program will run until manually stopped. An "END OF PASS" message is displayed after the completion of all allowed sections.

SWITCHES:

SW0 ..... halt after error (ARITH and POWER)
SW1 ..... inhibit error display (ARITH and POWER)
SW2 ..... loop on current section
SW3 ..... loop on error (ARITH only)
SW4 ..... do not run ARITHMETIC section
SW5 ..... do not run EXERCISER section
SW6 ..... do not run LOGIC section again
(LOGIC is always run at least once)
SW7 ..... print failure rate (ARITH only)
SW8 ..... execute the power-fail test

ERROR DESCRIPTION:

The following standard halts are provided in CPUØ8 in the power-fail and arithmetic sections.

077001	No power-fail interrupt detected on power shutdown.
077002	Checksum error. Memory has different data after power up/down was done.
077003	Invalid interrupt was detected. ACØ has device code of interrupting device.
077004	A restart occurred without an interrupt.
077005	An interrupt occurred, but the power-fail flag was not set.
077006	A memory non-compare occurred. AC1 has the data word found. AC2 has the data address which is also the data word expected.
077007	CPU did not run for 2 ms after power-fail interrupt. AC1 has the number of 4.4 micro-second counts that were done after an initial 36.05 micro-second time span that was started after the power-fail interrupt.
077010	Arithmetic section failed. AC3 has the actual P/C value. Subtracting 1000_8 will give the listing address of the error call.

SCANNER BOARD DIAGNOSTIC SCN05

ABSTRACT

This program is designed to test the logic circuits on the Entrex scanner board. The program will not run unless the "Maintenance -- Mode" switch is set to maintenance or a jumper is installed connecting Pin B49 to ground.

There is also a saction that allows scoping of the scanner logic. This section will display the character "A" on the terminal selected by the switches.

There is also a terminal address test that will verify that the terminal addressed is actually the correct one. This is done by outputting the terminal address to the top left position of the terminal and then reading it back and verifying that it was the same as written. The terminal address is read from the switches. If switch 4 is set, all terminal addresses from 00 to the address on switches will be done. If switch 5 is set, only the terminal address on the switches will be tested.

OPERATING PROCEDURE

1. Set the "Maintenance-Mode" switch to "Maint" or connect the jumper.
2. Load the program via the tape O.S.
3. The program will halt when loaded.
4. Set desired switches and hit continue.

SWITCH OPTIONS

SW0	Halt on Error
SW1	Inhibit Error Display
SW2	Loop on current test
SW3	Loop on error
SW4	Run sequential terminal address test
SW5	Run individual terminal address test
SW7	Run output scoping test
SW10-15	Terminal number for scoping section

SCN05
STANDARD HALTS FOR THE SCANNER DIAGNOSTIC:

Halt No.	Program ID No. 060000 Series
060001	Failed while testing BUSY and or DONE is reset after an IORST has been issued. If either one is set, this error will occur. Check AC0, if data bit 7 is on, DONE has not been reset; if data bit 8 is on, BUSY has not been reset.
060002	Failed while testing that the pulser should be turned off after an IORST has been issued. If the SHIFT flop is set or we are not in output mode this error will occur. If SHIFTO (Y4-12, Pg. 4) is at a level 0 state, check its inputs to find out whether SHIFT (Y4-13, PG. 4) is at a 0 level, and that OUTPUT MODE (Y4-1, Pg. 4) is at a 1 state.
060003	Failed while testing that the SCANNER is not BUSY, DONE, or PULSING after an IORST is issued. If BUSY, DONE, or the SHIFT flop is set a signal called SCAN NOT READY (Y4-6, Pg. 4) will go active and cause this error. Check (Y4-3, Pg. 4) SCNRBSY, (Y4-4, Pg. 4) SCNR DONE, or (Y4-5, Pg. 4) SHIFTO to find which one is causing the error; they should all be at a level 1 state.
060004	Failed while testing that the scanner is in maintenance mode. First make sure that the maintenance mode jumper has been put on pin B49 to GROUND on the back panel of the computer. Check AC0, if data bit 14 is not on we are not in maintenance mode. Maintenance mode status bit at chip Loc. U-3, Pg. 11.
060005	Failed while testing that the ICA Register can be loaded and incremented. AC0 contains the pattern loaded into the ICA Register, and AC1 contains the pattern read out of the ICA Register. Compare the two accumulators to find which count or data bit failed.
060006	Failed while testing that all 6 bits in the scanning counter can be loaded and read back successfully. AC0 contains the data pattern that was loaded into the SCANNING COUNTER. AC1 contains the pattern that was read out of the scanning counter, the pattern has been shifted down to data bits 15 through 10 for ease of comparing with AC0. Data bits 15 through 10 in AC1 correspond to data bits 5 through 0 which were the actual bits that were read from the scanning counter before they were shifted.
060007	Failed while testing the HIGH ORDER TERMINAL DECODER on Pg. 3. AC1 contains the status of the decoder, data bit 9 should be on. Check L8-9 (Pg. 3) to be at a 0 level at the same time as the DATIB SCNR SEL (L8-10) is at a 1 level.

Halt No.

060010 Failed while testing the HIGH ORDER TERMINAL DECODER on Pg. 3. AC1 contains the status of the decoder, data bit 9 should be on. Check L8-9 (Pg. 3) to be at a 0 level at the same time as the DATIB SCNR SEL (L8-10) is at a 1 level.

060011 Failed while testing that the DR EXTENSION register (H3-Pg. 6) can be loaded with all possible test patterns. AC0 contains the pattern that was loaded into the extension register. AC1 contains the pattern that was read out of the extension register, the pattern has been shifted down to data bits 15 and 14 for ease of comparing with AC0. Data bit 15 in AC1 corresponds to data bit 11 and data bit 14 corresponds to data bit 10 which were the actual bits that were read from the DR EXTENSION register before they were shifted.

060012 Failed while testing that the DATA REGISTER can be loaded and unloaded with a zeros pattern. AC1 contains the bit pattern that was read back from the data register. Any bit that is on is in error.

060013 Failed while testing that the DATA REGISTER can be loaded and unloaded with an all one's pattern. AC1 contains the bit pattern that was read back from the data register. Any bit that is not on is in error.

060014 Failed while testing that a one bit can be shifted through the DATA REGISTER. AC0 contains the pattern that was loaded into the data register, and AC1 contains the pattern that was read out of the data register. Compare the two accumulators and if they are not the same they are in error.

060015 Failed while testing that BUSY sets after a start pulse was issued. AC0 contains the scanner status, data bit 8 should be on. Check (Z4-5, Pg. 4) to make sure the BUSY flop did get set.

060016 Failed while testing that the scanner select busy line ($\overline{\text{Sel B}}$) went active after the BUSY flop got set. Check X4-5 (Pg. 4) to be at a 1 level state and the output (X4-6, Pg. 4) at its 0 level state.

060017 Failed while testing that busy can be cleared by an IORST after it has been set, and that the status also gets cleared. AC0 contains the BUSY status, data bit 8 should be off.

060020 See Halt No. 15.

Halt No.	
060021	See Halt No. 17 – exactly the same except a NIOC-clear pulse was used to clear busy instead of an IORST.
060022	Failed while testing to see if tc04 can be found; a complete clock cycle has been completed and tc04 has not been sensed in the status. AC1 contains the status of tc04, data bit 13 should be on. Check U3-10 (Pg. 11) should be at a level 1 state.
060023	Failed while testing that we can increment the clock from TC04 to tc01 (one clock phase). AC1 contains the status of tc04, data bit 13 should be off. Check U3-10 (Pg. 11) should be at a level 0 state.
060024	Failed after tc01 was found, the clock was stopped three more times and should be back to tc04. AC1 contains the status of tc04, data bit 13 should be on. Check U3-10 (Pg. 11) should be at a level 1 state.
060025	Failed while trying to increment the scanning counter. AC0 contains the pattern which should be in the scanning counter, AC1 contains the pattern that was read out of the scanning counter, the pattern has been shifted down to data bits 15 through 10 for ease of comparing with AC0. Data bits 15 through 10 in AC1 correspond to data bits 5 through 0 which were the actual bits read from the scanning counter before they were shifted. Check S5-9 (Pg. 2) to make sure the scanner is in its busy state, a one level. The scanning counter should get incremented every time TC04 gets clocked as long as we are in the busy state. Check S5-10 (Pg. 2) to make sure tc04 is clocking, every time it does the counter should increment.
060026	Failed while trying to increment the scanning counter. SCANNER done got set at TC02 time while the scanning counter was getting incremented, check W4-4 (Pg. 4) should always be at a level 0 state.
060027	Failed while testing the "stop scanner request" logic. Clock was INIT. To tc04 and advanced to tc02, busy should stay set until TC02 goes away. AC0 contains the status of busy, data bit 8 should be on. Check busy flop (W4-11, Pg. 4) does not get reset until the trailing edge of tc02.

Halt No.	
060030	Failed while testing the "stop scanner request" logic. Busy was set by a start pulse and the SCNR stop req. (U6-Pg. 4) flop was set by a NIOP pulse, the stop scan flop (R7-Pg. 4) should set at the trailing edge of TC01 which will cause the busy flop (W4-Pg. 4) to get reset on the trailing edge of TC02. AC0 contains the status of the busy flop, data bit 8 should be off.
060031	Failed while testing the "stop scanner request" logic. The stop SCAN flop has been set and has cleared out the busy flop at tc02. When the busy flop clears it should also clear out stop SCAN flop. We should be able to set the busy flop again at this time. AC0 contains the status of busy, data bit 8 should be on. Check R7 (Pg. 4) stop scan flop to make sure it was reset by SCNR busy.
060032	The stop scan flop has been set and should have cleared when the busy flop was clear at tc02 time. Busy has been set again and the clocks have been completely cycled twice. Busy should remain set and is not. AC0 contains the status of busy bit 8 should be on. Check R7 (Pg. 4) stop scan flop to make sure it is reset.
060033	Failed pulser test when trying to sense pulser on. A start pulse was issued to the pulser (NIOS 61) which should set the shift flop (T4-Pg. 5) and cause SHIFTO, (Y4-12, Pg. 4) to go to a logic zero level and be sensed on the select done line (X4-3, Pg. 4) as a logic one level.
060034	Failed to reset pulser to sense that the pulser was reset after on IORST. Shift flop (T4-Pg. 5) was set and should have been cleared by the IORST pulse, which would cause SHIFTO, (Y4-12, Pg. 4) to go to a logic one level and be sensed on the select done line (X4-3, Pg. 4) as a logic zero level.
060035	See Halt No. 33.
060036	Failed to reset pulser or sense the pulser was reset after the scanner busy flop (W4-Pg. 4) was set. SCNR busy being set should clear the shift flop (T4-Pg. 5) causing SHIFTO, (Y4-12, Pg. 4) to go to a logic one level and be sensed on the select done line (X4-3, Pg. 4) as logic zero level.
060037	See Halt No. 33. Make sure that SCNR BUSY is not keeping shift flop (T4-Pg. 5) reset. Check T4-13 should be at a level one state.

Halt No.	
060040	Failed to increment the pulser counter properly. The shift flop (T4-Pg. 5) should be set, and the PLSR CNT flop (T4-Pg. 5) should be set on the first cycle of the tc0 clocks. Then the tc0 clocks get cycled 15 times and increments the pulser counter to a count of 15. At this time we read the pulsers status reg. into AC0, data bit 12 should not be on. Check V4-11 (count 16) should be a logic level zero.
060041	Failed to increment to count 16 in the pulser counter. The pulser was started and the tc0's clocks were cycled 15 times to put a count of 15 into the counter, one more clock was issued to increment the count to 16. AC0 contains the status of the pulser counter, count 16. Data bit 12 should be on. Check V4-11 (Pg. 5), (count 16) to be at a logic one level.
060042	Failed to increment to count 24 in the pulser counter. The pulser was started and the TC0's clocks were cycled 24 times to increment the counter to 24. When count 24 is reached the pulser counter gets cleared to zero and the shift flop (T4-Pg. 5) also gets cleared. When the shift flop gets cleared SHIFTO, (Y4-12, Pg. 12) goes to a logic one level and is sensed on the select done line (X4-3, Pg. 4) being at a logic zero level, saying the pulser is off.
060043	Failed to set busy flop (W4-Pg. 4) after the pulser had been completely cycled from count 0 through count 24. When the pulser counter reaches a count of 24 it resets itself to 0 and sets a flop called OUT SYNC (U6-Pg. 5). OUT SYNC being set should set busy flop (W4-Pg. 4) at TC0 3 time. AC0 contains status of busy, data bit 8 should be on. Check OUT SYNC flop (U6-Pg. 5) sets at count 24 and places a one level state on W4-9 (Pg. 4) of the busy flop.
060044	Failed while doing the data register shift test. A pattern was loaded into the data register and is shifted down every time the pulser is clocked. AC1 contains the pattern that was loaded into the data register, and AC2 contains the pattern that was read out of the data register. Data register found on pages 6 and 8.
060045	Failed to reset DR Extension register (H3-Pg. 6). DR Extension register loaded with ones, an IORST was issued which should have cleared the register. AC0 contains the contents of the DR Extension register; it should be zero.

Halt No.	
060046	Failed to reset data register (Fe-Pg. 6), (R3, P3, N3-Pg. 8). Data register loaded with ones, an IORST was issued which should have cleared the register. AC1 contains the contents of the data register; it should be zero.
060047	See Halt No. 15.
060050	Same as Halt No. 45 except instead of an IORST resetting the register we set the busy flop (W4-Pg. 4) and that resets the register.
060051	Same as Halt No. 46 except instead of an IORST resetting the register we set the busy flop (W4-Pg. 4) and that resets the register.
060052	Failed while trying to increment clock to TC04 clock has been stepped 4 times and TC04 not sensed. AC1 contains status of TC04 clock, data bit 13 should be on. Check U3-10, Pg. (11) should be at a level 0 state.
060053	Unexpected interrupt. AC0 contains the device code.
060054	Not all terminals respond. In AC0 and AC1 corresponding bits are set for non-responding terminals 0-31.

REAL TIME CLOCK TEST – RTCØ1

ABSTRACT

RTCØ1 is a diagnostic program written to test the logic elements and reliability of the Real Time Clock.

The program has five tests as follows:

1. Test for IORST clearing DONE and BUSY.
2. Test for proper action on S, P, and C pulses.
3. Test for proper operation of the interrupt logic.
4. Test for correct amount of time between interrupts.
5. Elapsed time calculator. This section will allow the RTC to be checked against some external time source.

OPERATING PROCEDURE

1. Load RTCØ1 into memory.
2. When the CPU halts, set the desired switches and depress continue.
3. TEST 1 - TEST 4 will run continuously, displaying a pass counter after TEST 4 is completed.
4. a) To run TEST 5 (Elapsed Time Check), raise switch 6 (if desired) and then raise switch 5. If switch 6 was raised, the CPU will halt, waiting for the time of day to be entered into ACØ. Enter the hours and minutes (in military time) in BCD as follows:
   Switches 00-03 hold the tens of hours
   Switches 04-07 hold the units of hours
   Switches 08-11 hold the tens of minutes
   Switches 12-15 hold the units of minutes
   After depositing the information into ACØ, lower switch 15 and depress continue.

   b) When the external time source is at a convenient time setting, raise switch 15. This will start the elapsed timer.

   c) Any time switch 15 is up, the time will be displayed in HH:MM:SS format every second.

SWITCH SETTINGS:

SWØ	halt on error
SW1	inhibit error display
SW2	loop on current test
SW3	loop on error
SW4	not used
SW5	execute the elapsed time tests (TEST 5)
SE6	halt and accept BCD time of day (switch 6 is only checked at the start of TEST 5)
SW15.....	(when initially raised) start E.T. calculation (when raised any time afterward) display time

NOTE

To run RTCØ1 on a double-bay BCG, change the word at location 50_8 from zeros to some non-zero value.

STANDARD HALTS FOR RTC01

PROGRAM ID 064

HALT #	MEANING
010	BUSY and DONE not reset by IORST
011	BUSY not reset by IORST
012	DONE not reset by IORST
020	BUSY did not set with "S" pulse
021	BUSY did not reset with "P" pulse
022	DONE did not reset with a "P" pulse
023	DONE still set after a "C" pulse
024	DONE not set by "S" pulse
030	No interrupt occurred with the clock masked on (AC0 has the mask)
031	DONE was reset when returning from an interrupt
032	DONE failed to reset after NIOC
033	Interrupt occurred with clock masked off (AC0 has mask)
034	An interrupt occurred after all devices were masked off (AC0 has device code)
035	An interrupt occurred from an unknown device (AC0 has device code)
036	An RTC interrupt occurred after the clock was masked off
040	Interrupt did not occur with clock masked on (AC0 has mask)
041	A second interrupt did not occur after the first one
042	RTC is running fast by more than 5% off tolerance with a regular NOVA CPU
043	RTC is running slow by more than 5% on a regular NOVA CPU

HALT #	MEANING
044	RTC is running fast by more than 5% on a NOVA 1200 type CPU
045	RTC is running slow by more than 5% on a NOVA 1200 type CPU

CARD READER DIAGNOSTIC – CDRØ2

ABSTRACT

CDRØ2 is a diagnostic program that checks the logic and operability of the ENTREX card reader and controller. There are two (2) modes of operation: The Diagnostic Mode (checks the controller and interface logic) and the Manual Mode (checks the transport error reporting logic).

OPERATING PROCEDURE

1. Load CDRØ2 into memory.
2. When the CPU halts, set the switches desired.
3. Load a card deck of at least 100 cards.
4. Place the reader on line.
5. Press CONTINUE.

If a manual test has not been selected, the program will run indefinitely as long as cards are kept in the input hopper. Each diagnostic pass takes only a few seconds. A pass counter is updated and displayed at the end of each pass. If a manual test is selected, the program displays specific instructions for the operation of that test.

SWITCH SETTINGS:

Switch Ø . . . . halt on error
Switch 1 . . . . inhibit error display
Switch 2 . . . . loop on current test
Switch 3 . . . . loop on current test if an error was found
Switch 4 . . . . read image cards
Switch 9 . . . . do not print the pass counter
Switch 10 . . . run READ ERROR test
Switch 11 . . . run HOPPER EMPTY test
Switch 12 . . . run STACKER FULL test
Switch 13 . . . run READY STATUS test
Switch 14 . . . run DATA LATE test
Switch 15 . . . run MOTION CHECK test

NOTES:

1. The diagnostic section requires that the cards that are used contain a punched hole in each row at least once per 40 cards.
2. The image cards must be punched so that the data in columns 1-40 is the same as that in columns 80-41 , respectively. (The card can be folded in half and the holes on both halves should match).

STANDARD HALTS FOR CDRØ2

PROGRAM ID Ø16

HALT #	MEANING
001	BUSY was not reset by IORST
002	DONE was not reset by IORST
003	Address register not reset by IORST (ACØ contains results of DIB)
004	Pending interrupts not cleared by IORST (ACØ has device code of interrupting device)
005	BUSY was set after "C" pulse
006	DONE was set after "C" pulse
007	Address register had bits set after a "C" pulse (ACØ has information)
010	Address register incorrect (ACØ has DOB data, AC1 has DIB data)
011	Card reader responds to device code contained in ACØ
012	Card reader does not respond to device code 16
013	BUSY was not set by "S" pulse
014	BUSY was not reset by IORST
015	BUSY was not reset by "C" pulse
016	DONE did not set within one second after a read was started
017	DONE was not reset by IORST
020	DONE was not reset by "C" pulse
021	Address register incorrect after a card was read. (ACØ has calculated ending address, AC1 has actual ending address found, AC2 has starting address)
022	After reading 5Ø cards, all rows were not sensed at least once. (ACØ has a bit set for each row that was sensed at least once. Bits 4-15 correspond to rows 12, 11, 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9).
023	No interrupt occurrred after a card was read

HALT #	MEANING
024	Interrupt condition was not cleared by a "C" pulse
025	No interrupt from card reader when mask was C (AC0)
026	Interrupt from card reader when it was masked off (C (AC0) = device code)
027	Read error status bit or unusual end status bit not sensed. (C (AC0) = results of DIA)
030	Hopper check or unusual end status bits not sensed (C (AC0) = DIA information)
031	Hopper check or unusual end status bits not sensed (C (AC0) = DIA information)
032	Ready status bit not sensed (C (AC0) = DIA information)
033	Data Late status bit not sensed (C (AC0) = DIA information)
034	Motion check status bit not sensed (C (AC0) = DIA information)
035	Unknown interrupt (AC0 has the device code of the interrupting device)
036	Status error detected after a card was read (C (AC0) = DIA information)
037	Data miscompare while reading image cards. (C (AC0) = left column data, C(AC1) = right column data, C (AC2) = octal column number)

LINE PRINTER DIAGNOSTIC – PRTØ2

ABSTRACT

The printer diagnostic test is designed to test the controller logic and printer mechanics of CENTRONICS, DATA PRODUCTS, or DATA PRINTER printers.

OPERATING PROCEDURE

1. Load PRTØ2 into memory
2. The switch settings will be displayed on the Data Scopes only
3. When the CPU halts, set the switches and depress CONTINUE

SWITCH SETTINGS

Switch 0 ..... HALT ON ERROR
Switch 1 ..... DON'T PRINT ERRORS
Switch 2 ..... LOOP ON CURRENT TEST
Switch 3 ..... LOOP IF ERROR
Switch 4 ..... DATA PRODUCTS PRINTER
Switch 5 ..... Not used
Switch 6 ..... Not used
Switch 7 ..... Not used
Switch 8 ..... AUTO LP INSTALLED
Switch 9 ..... 8Ø COLUMNS ONLY
Switch 10 ..... EXECUTE DIAGNOSTIC SECTION
Switch 11 ..... PRINT E's
Switch 12 ..... PRINT EQUAL SIGNS
Switch 13 ..... PRINT M'S
Switch 14 ..... FILL EACH LINE WITH ONE CHARACTER
Switch 15 ..... PRINT RIPPLED PATTERN

STANDARD HALTS FOR PRTØ2

HALT #	DESCRIPTION
017001	BUSY is grounded at backplane. Check SELB(A8Ø)
017002	DONE is grounded at backplane. Check SELD(A82)
017003	DONE is set in controller after an IORST
017004	BUSY is set in controller after an IORST
017005	DIB to device Ø read back bit 15. (ACØ has result of DIB).
017007	DIB to printer read back data. (ACØ has result of DIB).
017010	DIA to device Ø read back data. (ACØ)
017011	Interrupt occurred with all bits masked off.
017012	Interrupt occurred when ION was enabled with all bits on.
017013	INTA was done after IORST and a device code was transferred into ACØ.
017014	A carriage return was sent to the printer and BUSY did not set.
017015	DIA instruction did not receive bit 15 (on line) ACØ has result of the DIA.
017016	A carriage return was sent to the printer and BUSY did not reset after about 5 ms.
017017	A START pulse to device Ø set the BUSY flop in the printer controller.
017020	A DOA without a START pulse was sent to the printer and the BUSY flop set.
017021	A carriage return followed by a NIOC to the printer failed to clear the BUSY flop.
017022	A carriage return followed by a SKPBZ to device Ø allowed the printer's BUSY to be gated.
017023	A carriage return followed by an IORST failed to clear the BUSY condition.
017024	A line feed to the printer did not set DONE. A line feed was sent to the printer, setting the DONE flop, then a clear pulse was sent and the DONE flop failed to reset.

HALT #	DESCRIPTION
017026	A line feed was issued which set the DONE flop. Then, a START pulse was sent and the DONE flop failed to reset.
017027	A carriage return followed by a space was sent to the printer. The DONE flop was set when the space was sent.
017030	The printer's DONE flop was set, a SKPDZ was issued to device Ø and the SELD line was set.
017031	The DONE flop was set and the ION allowed, but the printer did not interrupt. ACØ has result of INTA.
017032	The DONE flop was set, a DIA issued to device Ø, and something was loaded into ACØ.
017033	The wrong device code was transferred via the INTA. ACØ has the code received.
017034	The DONE flop was set, but, the printer failed to interrupt.
017035	Bit 12 failed to mask off the printer interrupt; ACØ has the device code of interrupting device.
017036	The printer failed to interrupt, even with bit 12 reset. ACØ has device code from INTA.
017037	IORST did not clear the interrupt request from the printer
017040	IORST did not clear the INT DISABLE flop in the printer controller
017041	An octal 17 was sent to the controller, but, the DONE flop set, indicating bit 14 not being gated properly.
017042	An octal 11 was sent to the controller, but, the DONE flop was set, indicating bit 13 not being gated properly
017043	An octal Ø 5 was sent to the controller, but, DONE flop was set, indicating bit 12 not being gated properly
017044	An octal 35 was sent to the controller, but, the DONE flop was set, indicating bit 11 not being gated properly
017045	An octal 55 was sent to the controller, but, the DONE flop was set, indicating bit 10 not being gated properly.
017046	An octal 115 was sent to the controller, but, the DONE flop was set, indicating bit 9 not being gated properly
017047	A line feed (octal 12) was sent to the controller but the DONE flop did not set.
017050	The printer is off line.

COMMUNICATIONS DIAGNOSTIC XOMØ1

XOMØ1 is a diagnostic that is a gate by gate check of most of the communications controller logic.

The program consists of 2 sections:-

i) Diagnostic Section (Address 1000)
ii) Reliability Section (Address 3730)

SWITCH SETTINGS

Switch 0 up – proceed from error

Switch 1 up – inhibit printing

Switch 2 up – print failure rate

Switch 3 up – ICL controller

OPERATING PROCEDURE FOR IBM CONTROLLER

1. Insert Plug A into communication output socket.
2. Load XOMØ1
3. Depress continue for Diagnostic section or set address 3730 for reliability
4. When running diagnostic section a Pass N complete message will be given at the end of each pass.

OPERATING PROCEDURE FOR ICL CONTROLLER

1. Insert Plug A into communication output socket for Diagnostic or
2. Plug B for Reliability section.
3. Load XOMØ1.
4. Set switch 3 and depress continue for Diagnostic or set address 3730 for reliability.
5. When running a Pass N complete message will be given at the end of each pass.

N.B.

If the Diagnostic section is run after the Reliability section without reloading the program check that address 3456 contains 001042 if not alter contents to 001042.

Due to the fact that the ICL Controller needs Carrier on high to run correctly part of the Diagnostic section for IBM controller is run in the Reliability section.

If Halt occurs at location PC 001261 make a very careful check of the priority interrupt wiring.

If Halt occurs at location PC 002015 check to see if the test plug is inserted in lieu of the output cable.

RELEASE 5 DIAGNOSTIC PROGRAM LOADER

The diagnostic program loader used in Release 5 diagnostic programs is a module that will load diagnostic programs from tape (9/800, 9/1600 or 7/800 or disk).

The loader also includes software to allow a program to be saved to any type tape or disk regardless of the media from which it was originally loaded.

Once brought into memory the loader always occupies memory locations $17000_8 - 17777_8$.

Loading Programs Into Memory:

A) From the disk:

1. Raise the COLD START ENABLE Switch.
2. Raise and release the DISK C/S Switch.
3. The CPU should halt at 17445_8.
4. Set the octal program number into switches 10 – 15 (the settings of the other switches are ignored by the loader).
5. Depress CONTINUE.
6. The program will be loaded into memory and executed.

B) From tape:

1. Raise the COLD START ENABLE Switch.
2. Raise and release the TAPE C/S Switch.
3. The CPU should halt at 17020_8 if the tape is a 9-channel type or at 17163_8 if it is a 7-channel device.
4. Set the octal program number into switches 10 – 15 (the settings of the remaining switches are ignored).
5. Depress CONTINUE.
6. The tape will rewind and the requested program will be located, loaded into memory and executed.

Note: If the switches are set to all zeros in Step 4, the tape will not be rewound and the next sequential program will be loaded into memory and executed.

Program Save Facility:

To save a loadable image of the program presently in memory, proceed as follows:

A) To write image to a 9/800 bpi tape –

1. Set the switches to 000010_8.
2. Raise and release the START Switch.
3. The loadable program will be written to tape, an end-of-file will be written, the tape will be backspaced and the program will be restarted.

B) To write image to a 9/1600 bpi tape –

1. Set the switches to 000011_8.
2. Raise and release the START Switch.
3. The program will be written to tape, and end-of-file will be written, the tape will be backspaced and the program will be restarted.

C) To write image to a 7-channel tape –

1. Set the switches to 000012_8.
2. Raise and release the START Switch.
3. The program will be written to tape, an end-of-file will be written, the tape will be backspaced and the program will be restarted.

D) To write image to a disk –

1. Set the switches to 000013_8.
2. Raise and release the START Switch.
3. A disk cold-start program is written to the disk. Then, the program is written to disk as octal program number 01 and the program is restarted.

E) To write image to a disk when the octal program number is not to be 01 –

1. Set the switches to 000014_8.
2. Raise and release the START Switch.
3. The CPU will halt at 17445_8.

4. Set switches 10 – 15 to the octal program number desired and depress CONTINUE.

5. The program is written to the disk as the octal program requested and the program restarted.

Notes:

1) The minimum memory required for all except the 7-channel load/save is 17777_8 locations. The 7-channel load/save requires at least 37777_8 locations.

2) The maximum octal program number allowed is 77_8.

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SYSTEM DIAGNOSTIC – SYSD1

Introduction

The REDIFON system diagnostic (SYSD1) is an interactive system exerciser designed to simulate a REDIFON customer environment, yielding detailed error reporting.

The program can basically be divided into two control sections: the terminal exerciser and the interactive device supervisor.

The terminal exerciser section allows User selected functions to be executed upon individual terminals.

The supervisor section allows the User to control (from any terminal) the selection of devices to be included in the system exerciser.

Both operating modes are controlled by HELP List selections similar to REDIFON system software.

Errors detected by the system diagnostic are displayed, at the User's selection, to the DATA/SCOPE and/or line printer. Error reporting for any or all devices can be inhibited.

The minimum machine configuration necessary for operation of the system diagnostic is as follows:

- 8K memory
- 1 DATA/SCOPE
- 1 tape or disk unit

The maximum configuration is as follows:

- 32K memory
- 32 DATA/SCOPEs
- 4 disk units
- 3 tape units
- 1 printer

Operation Procedure

1. Load SYSD1 into memory.

2. Depress any key on any terminal.

3. The DATA/SCOPE Exerciser HELP List (HL1, page 9–86) is displayed.

4. Two options are available: (SEE NOTE 1)

   a. Exercise the terminal; or

   b. Exercise the CPU/IO (Supervisor Mode).

   If the Supervisor Mode is desired, enter S. If the terminal exerciser is desired, enter any function as described in the following section.

NOTE 1: Having loaded the program and obtained the Terminal Exerciser Help list in item 3 above, the keyboard type should be identified using option T prior to executing any further options.

Terminal Exerciser

1. The following functions may be executed:

   K Clear screen: The entire display area will be blanked.

   U Roll-up: The entire display area will be shifted up one line. The top line will become the bottom line. (Note: On old style terminals, the bottom line will be altered.)

   X Error beep: Will cause a continuous error tone.

   E Enter Data: Will echo User entered keystrokes (control keys are displayed on the top line). To exit from this function, depress HELP Key, then select any function.

   C Copy down: The top line will be duplicated on the second line.

   O Output characters: Will fill the display area with a full screen of each keyboard character. Selecting any function will stop this function.

   ? Display options: Will cause the terminal exerciser HELP List to be displayed.

   D Roll-down: The entire data area will be shifted down one line. The bottom line will become the top line. (Note: on old style terminals, the top line will be altered.)

   Z Field Beep: The Field Release tone will be beeped.

   T Identify terminal: Allows the User to inform the system of the type of keyboard (029 or typewriter) being used at this terminal.

   I Display terminal #: Will display the logical terminal number in octal.

2. Selecting L will cause the U, C, D, or X functions to loop whenever they are selected. Selecting N will nullify the loop.

Supervisor Mode

The following functions are available.

A – START DEVICE:

Will allow the User to begin exercising a device as selected from the device selection HELP List (HL3, page 9–87).

I) The selection of TAPE 1, TAPE 2 or TAPE 3 will cause that device to be started and the Supervisor Mode HELP List (HL2, page 9–86) to be displayed.

II) The selection of DISK 0, DISK 1, DISK 2 or DISK 3 will display a HELP List requesting which test will be run (HL5, page 9–88).

The following are available:

A. READ — Will read randomly, checking for status errors only.

B. PREP — Will write to all surface areas, verifying that the data is written correctly.

C. READ/VERIFY — Will read randomly, verifying that the correct data is read as well as the correct status information is received. The disk must have been PREPed prior to executing this test.

D. WRITE/VERIFY — Will write, read back and verify random locations on the disk pack.

Following the test selection, a HELP List requesting the read/write mode will be displayed (HL6, page 9–88). Select one of the three modes available.

III) The selection of PRINTER will cause a HELP List to be displayed requesting the print function to be done (HL7, page 9–88). There are five functions available.

1. RIPPLED PATTERN: Will print the character set on each line, shifting the character set left one position each time.

2. RPT 1 CHAR: Will repeatedly print a full line of the character entered in response to the following message: ENTER THE ASCII OCTAL CODE FOR THE CHARACTER TO BE PRINTED.

3. DMP MEM: Will print (in octal) the contents of memory contained within the limits entered.

4. DMP DCB: Will print (in octal) the contents of the DCB for the device selected when the DCB SELECT HELP List requesting the device selection is displayed (HL4, page 9–87).

5. 1 LINE/CHAR: Will print a full line containing only 1 character for each character in the character set.

Note: 1) If functions 1, 2 or 5 are selected, a HELP List requesting the print width is displayed (HL8, page 9–89). Select one of the three print widths.

2) On printers with automatic carriage-return-line-feed, there will be a blank line after each data line when executing selections 1, 2, or 5.

B – DELETE A DEVICE:

Will allow the User to stop exercising the device selected from the Device Select HELP List (HL3, page 9–87).

C – DISPLAY STATUS:

Will display the DCB for the device selected from the DCB Select HELP List (HL4, page 9–87). The DCB will be displayed in two sections (DCB1, page 9–91 and DCB2, page 9–91). First, the PDL pointer and PDL words are displayed. Then, when the REL Key is depressed, the remaining entries are displayed. Depressing " ← " will re-display the first part of the DCB.

D – START MEMORY TEST:

When selected, this function will request memory address limits and will start the memory exerciser (providing valid memory limits are entered).

E – STOP MEMORY TEST:

Will stop the memory exerciser.

F – ASSIGN LOG D/S:

Will allow the User to change the DATA/SCOPE assigned to display system errors.

The DATA/SCOPE 00 is pre-set at the start of the test.

G – SET DEVICE PSW:

Will allow the User to establish the device Program Switch Word associated with the device selected from the DCB Select HELP List (HL4, page 9–87).

H – EXAMINE MEMORY:

Will display the data contained in any memory location requested. Addresses may be entered with leading zeros omitted. When the address is requested, depressing the cursor left (←) key will fetch the previous address. Depressing cursor right (→) will fetch the next continuous address. Depressing AUTO will continuously read and display the data at the present address. Depressing LOC RET will stop it.

I – ALTER MEMORY:

Allows the User to change the data at any memory location. Addresses and data may be entered with leading zeros omitted. The left and right cursor functions are the same as in EXAMINE MEMORY.

J – SET ERROR PRINT SW:

This function allows the User to cause all error displays to be printed on the line printer as well as displayed on the error logging DATA/SCOPE.

The message "ENTER (IN OCTAL) THE MAXIMUM NUMBER OF ERRORS TO BE PRINTED: _ _ _ _ _ _" is displayed. Depressing HELP will cause the ERROR PRINT Switch to be turned off. Entering any valid octal number will cause all errors to be printed on the printer and displayed on the error log DATA/SCOPE when they occur. The number entered is the maximum number of errors to be printed before reverting back to logging errors to the error log DATA/SCOPE only.

K – ASSIGN TAPES:

This function allows the User to equate physical tape units to the logical names of TAPE 1, TAPE 2 and TAPE 3.

When selected, the allowable values and the current assignments are displayed (HL9, page 9–89).

Selections are made by entering a 3-digit octal number as described in the HELP List.

Depressing HELP will cause the program to return to the Supervisor Mode option select without altering the assignments. Depressing FIELD REL without entering any data will cause the program to verify and establish the tape assignments entered.

L – WRITE SYSTEM ID:

This function allows the system ID to be entered and written to Disk Unit 00. Enter the decimal System ID # when requested.

Error Logging

Errors are logged to the DATA/SCOPE specified and, optionally, to the line printer.

Errors logged to the DATA/SCOPE are in two different formats.

1. DATA MISCOMPARE:

   Will display the ID, the failing address, the data word found there and the data word expected (ER2, page 9–90).

2. I/O ERROR:

   Will display the ERROR ID, the last DOA, DOB, DOC, DIA, DIB and DIC commands, the unit number and the device code (ER1, page 9–90).

If the errors are being logged to the printer, the last two lines (of either format) are not displayed.

If the errors are not being logged to the printer, the User has the option of Printing the DCB, Displaying the DCB on the DATA/SCOPE, Terminating the device exercise section, Setting a new PSW, or RELeasing the device from error logging (which will then proceed according to front panel and/or PSW settings).

If errors are being logged to the printer and the printer exerciser is running, the printer exerciser will be interrupted, the error log printed, and the printer exerciser resumed.

Switch Settings

There are two levels of switch settings used by the System Exerciser. The highest level is the front panel switch setting. The lowest level is the Program Switch Word stored in the individual device's DCB area.

The switch settings are as follows.

1. SWITCH 0 — Of the front panel set to a 1 (raised) in conjunction with Switch 0 set to a 1 of the PSW of device causing an error will cause a HALT to be executed. If either switch is reset, the HALT will not be executed.

2. SWITCH 1 — Of the front panel set to a 1 will inhibit all error displays.

3. SWITCH 1 — Of the PSW set to a 1 will inhibit all error displays for that device only.

4. SWITCH 3 — Of the PSW set to a 1 will cause the error condition to be retried (after the error is displayed, providing Switch 1 was not set).

Tape Exerciser

The Tape Exerciser section writes a random number of random sized blocks of random data to tape, rewinds the tape and verifies the data.

Functionally, the Tape Exerciser operates as follows:

STEP 1: Rewind the tape.

STEP 2: Select a random number from 24_8 to 4000_8 to be used as the number of blocks to be written this pass.

STEP 3: Select a random number from 12_8 to 400_8 to be used as the number of words in each block this pass.

STEP 4: Select a random number and fill the tape buffer with it.

STEP 5: Write the tape buffer (using the block size gotten in STEP 3) to tape.

STEP 6: Execute STEP 4 and STEP 5 for the number of blocks gotten in STEP 2.

STEP 7: Rewind the tape.

STEP 8: Use the same starting number as used the first time STEP 4 was done.

STEP 9: Select a random number.

STEP 10: Read a block from tape.

STEP 11: Verify that the data read consists of the correct data (the number gotten in STEP 8).

STEP 12: Execute STEP 9, STEP 10 and STEP 11 for the number of blocks gotten in STEP 2.

STEP 13: Backspace twice.

STEP 14: Write an End Of File Record.

STEP 15: Backspace.

STEP 16: Write an E.O.F.

STEP 17: Backspace twice.

STEP 18: Rewind the tape.

STEP 19: Go to STEP 1.

Disk Exerciser

There are four sections to the disk exerciser.

1. READ:

   This section will read, in a random manner, using the mode selected. The status word is checked for errors after each read.

2. PREP:

   This section will write on all surface areas of the disk, using the mode selected. The data written consists of a block filled with the DOC command word.

3. READ/VERIFY:

   This section will read from random areas of the disk, in the mode selected. The data read is checked to verify that it consists of the DOC command word as written in Section 2 (PREP) of the disk exerciser.

4. WRITE/VERIFY:

   This section will write to random areas of the disk, in the mode selected. The data written consists of the DOC command word. The data is read back immediately and verified.

Printer Exerciser

There are five sections to the printer exerciser.

1. RIPPLED PATTERN:

   Data consisting of the complete data character set is printed on the line printer. Each line starts with the character that was printed in the second column of the previous line.

2. RPT 1 CHAR:

   The ASCII character selected will be printed on all columns of the line printer repeatedly.

3. DMP MEM:

   The contents of the memory locations selected will be printed in groups of 100_8 words.

4. DMP DCB:

   The contents of the DCB selected will be printed.

5. 1 LINE/CHAR:

   Data consisting of a full line of each character in the character set will be printed.

Memory Exerciser

The memory exerciser will write in a sequential manner, a data pattern of address-in-address to all locations within the limits selected. Then, a data pattern of complement-of-address-in-address is written.

The memory exerciser's low test limit is set to the end of the DCB's for the DATA/SCOPEs.

Device Control Block

A Device Control Block (DCB) is a block of memory assigned to a device and is used to contain information unique to that device. The block is 100_8 words long.

Each device or major program element has a DCB assigned to it and that DCB is used only by that device or major program element.

The first 20_8 words of a DCB are used for accumulator storage when entering subroutines that contain re-enterable code. The first word of the DCB is a pointer that is set to the next available word (of the 20_8 words).

The remaining 60_8 words are used to store information such as the last status received from the device, or the unit number, etc.

The DCB information for each device is given in the following paragraphs.

.PC 21	.TERM 22	.KEY 23	.KBID 24	.HDSW 25
.DISP 26	C1 27	C2 30	C5 31	C6 32
.PSWS 33	D4 34	D5 35	AC0 36	AC1 37
AC2 40	AC3 41	.COUNT 42	.XYZ 43	DHLPA 44
DHLPB 45	.MODE 46	.OPTP 47	.DOA 50	.DOB 51
.DOC 52	.DIA 53	.DIB 54	.DIC 55	.OPIN 56
.TAD 57	.TEL 60	.CNT1 61	.CNT2 62	.CNT3 63
.CNT4 64	.CNT5 65	.CNT6 66	.CNT7 67	 70

DCB ADDRESSES:

D/S 00: 12700	D/S 20: 20000	TAPE1: 15400
D/S 01: 13000	D/S 21: 20100	TAPE2: 15500
D/S 02: 13100	D/S 22: 20200	TAPE3: 15300
D/S 03: 13200	D/S 23: 20300	
D/S 04: 13300	D/S 24: 20400	DISK00: 14700
D/S 05: 13400	D/S 25: 20500	DISK01: 15000
D/S 06 13500	D/S 26: 20600	DISK02: 15100
D/S 07: 13600	D/S 27: 20700	DISK03: 15200
D/S 10: 13700	D/S 30: 21000	DISK03: 15200
D/S 11: 14000	D/S 31: 21100	PRINTER: 15600
D/S 12: 14100	D/S 32: 21200	
D/S 13: 14200	D/S 33: 21300	MEMTEST: 15700
D/S 14: 14300	D/S 34: 21400	
D/S 15: 14400	D/S 35: 21500	
D/S 16: 14500	D/S 36: 31600	

Device Control Block Layout For DATA/SCOPE

Word #	Name	Significance
00	.PDL	Push Down List Pointer.
01–20		Push Down List.
21	.PC	Program Counter to be used when this DCB gets control next time.
22	.TERM	Octal terminal number.
23	.KEY	Next available keystroke (–1 if none).
24	.KBID	Address of keyboard translate table.
25	.HDSW	Indicator to tell if the DATA/SCOPE has been used yet (–1 if it has).
26	.DISP	Octal display position in use right now ($0–737_8$).
27–32		Utility subroutine temporary storage area.
33	.PSWS	Bit 2 set to 1 indicates that the Loop function is in effect.
34–42		Utility storage area.
43	.XYZ	Contains the character being output when in the Output character mode.
44–77		Not used.

Device Control Block Layout For Tapes

Word #	Name	Significance
00	.PDL	Push Down List Pointer.
01–20		Push Down List.
21	.PC	Program Counter to be used when this DCB gets control next time.
22	.TERM	Holds the unit number of the tape.
23		Not used.
24	.KBID	Holds the device code of the tape.
25	.HDSW	Holds the count of the number of blocks to be written or read this pass.
26	.DISP	Holds the random number used the first time for each pass.
27		Not used.
30	C2	Holds current tape buffer data word when checking or filling the tape buffer.
31	C5	Utility storage.
32		Not used.
33	.PSWS	Program Switch Word for this DCB (SW0 = halt on error, SW1 = inhibit error display, SW3 = retry errors).
34		Not used.
35	D5	Holds current tape buffer address when checking the tape buffer data.

Word #	Name	Significance
36–41		Not used.
42	.COUNT	Time out counter.
43	.XYZ	Holds last random number.
44, 45		Not used.
46	.MODE	Parity option indicator (0 = odd).
47		Not used.
50	.DOA	Last DOA command issued.
51	.DOB	Last DOB command issued.
52	.DOC	Last DOC command issued.
53	.DIA	Results of last DIA.
54	.DIB	Results of last DIB.
55	.DIC	Results of last DIC.
56	.OPIN	When set to non-zero value, indicates this DCB to be terminated next time control is given to it.
57	.TAD	Tape buffer address.
60	.TBL	Tape buffer length (in words).
61	.CNT1	Number of blocks to be written/read this pass.
62–77		Not used.

Device Control Block Layout For Disk

Word #	Name	Significance
00	.PDL	Push Down List Pointer.
01–20		Push Down List. If a disk buffer mismatch occurs, Word 3 contains the correct data and Word 4 the error data
21	.PC	Program Counter to be used next time this DCB gets control.
22	.TERM	Unit number of the disk.
23		Not used.
24	.KBID	Holds the disk device code (32).
25, 26		Not used.
27–32		Utility storage areas.
33	.PSWS	Program Switch Word for this DCB (SW0 = halt on error, SW1 = inhibit error log, SW3 = retry errors).
34–41		Utility storage areas.
42	.COUNT	Time out counter.
43–45		Utility storage areas.
46	.MODE	Disk mode being used (0–2).
47	.OPTP	0 = random reads. 1 = random reads/verify. 2 = random writes/verify. 3 = prep.
50	.DOA	Last DOA issued.
51	.DOB	Last DOB issued.

Word #	Name	Significance
52	.DOC	Last DOC issued.
53	.DIA	Results of last DIA.
54	.DIB	Results of last DIB.
55	.DIC	Results of last DIC.
56	.OPIN	When set to non-zero value, indicates this DCB to be terminated when control is given to it next time.
57	.TAD	Disk buffer address.
60		Not used.
61	.CNT1	Cylinder number last used.
62	.CNT2	Track number last used.
63	.CNT3	Sector number last used.
64	.CNT4	Pseudo-sector number last used.
65–77		Not used.

Device Control Block Layout For the Printer

Word #	Name	Significance
00	.PDL	Push Down List Pointer.
01–20		Push Down List.
21	.PC	Program Counter to be used when this DCB gets control next time.
22–27		Not used.
30	C2	Utility storage area.
31–34		Not used.
35	D5	Utility storage area.
36–42		Not used.
43	.XYZ	Holds character to be printed in Col. 1.
44, 46		Not used.
47	.OPTP	X0 = 160 column. X1 = 132 column. X2 = 080 column. 0X = Rippled pattern. 1X = 1 char. repeated. 2X = DCB Dump. 3X = Mem. Dump. 4X = 1 line/char.
50	.DOA	Last DOA issued.
51, 52		Not used.
53	.DIA	Result of last DIA.

Word #	Name	Significance
54, 55		Not used.
56	.OPIN	When set to non-zero value, indicates the DCB to be terminated next time control is given to it.
57	.TAD	Holds starting memory address to be dumped or holds the DCB address to be dumped.
60	.TBL	Holds ending memory address to be dumped.
61–77		Not used.

Device Control Block Layout For the Memory Exerciser

Word #	Name	Significance
00	.PDL	Push Down List Pointer.
01–20		Push Down List.
21	.PC	Program Counter to be used next time this DCB gets control.
22–27		Not used.
30	C2	Holds the data word written last.
31, 32		Not used.
33	.PSWS	Program Switches Word. SW0 = Halt on error. SW1 = Inhibit error log. SW3 = Retry error.
34		Not used.
35	D5	Holds the address being tested.
36–50		Not used.
51	.DOB	Data word last read.
52	.DOC	Number of passes completed.
53	.DIA	Lowest address to be tested.
54		Not used.
55	.DIC	Highest address to be tested.
56–77		Not used.

STANDARD HALTS FOR SYSD1

PROGRAM ID: 071000

Halt #	Meaning
001	Disk time out.
002	Disk status error.
003	Disk not ready.
004	Disk buffer mismatch. (See Disk DCB words 3 and 4).
005	Memory failure.
006	Tape status error doing a backspace.
007	Tape status error writing an EOF.
010	Tape time out.
011	Tape buffer mismatch.
012	Tape status error writing data.
013	Tape status error reading data.

NOTES:

1. The error logging DATA/SCOPE is preset to D/S#00. If you have not got a D/S#00, assign the error log device to a DATA/SCOPE that is available prior to starting any devices. See selection F of HL2.
2. The number of DATA/SCOPEs that will be run by SYSD1 is reduced from 32 to 16 when running on an 8K system.
3. Restarting at 1000 will clear all DCB's to zeros. Therefore, all devices must be started again.

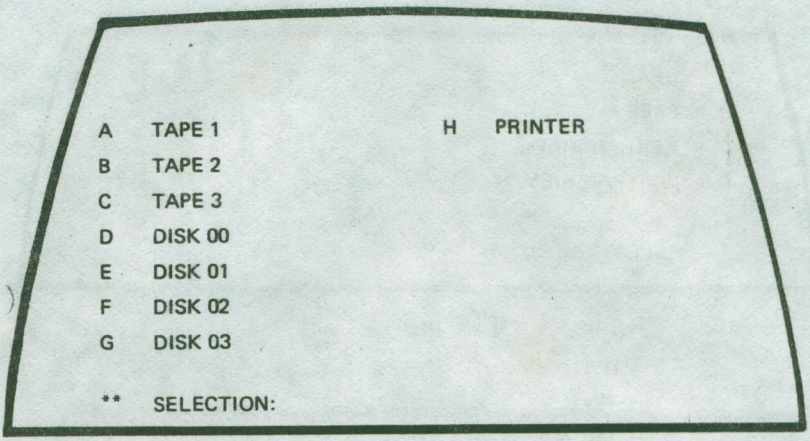
HELP LIST DISPLAY FORMATS

```
*   ENTER OPTION CHARACTER   * (XX.XXX)

K   CLEAR SCREEN             ?   DISPLAY OPTIONS
U   ROLL UP                  D   ROLL DOWN
X   ERROR BEEP               Z   FIELD BEEP
E   ENTER DATA               T   IDENTIFY TERMINAL
C   COPY DOWN                I   DISPLAY TERMINAL #
O   OUTPUT CHARS             L   SET LOOP
S   SUPERVISOR MODE          N   RESET LOOP
```

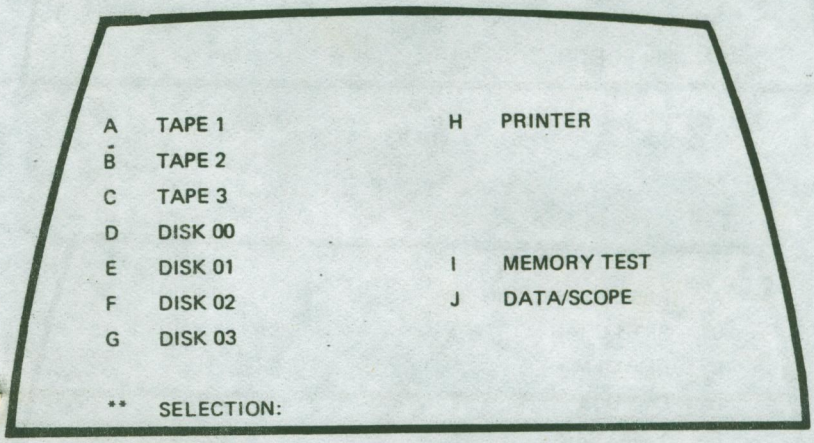
HL1

```
A   START A DEVICE           H   EXAMINE MEMORY
B   DELETE A DEVICE           I   ALTER MEMORY
C   DISPLAY STATUS           J   SET ERROR PRINT SW
D   START MEMORY TEST
E   STOP MEMORY TEST
F   ASSIGN LOG D/S           K   ASSIGN TAPES
G   SET DEVICE PSW            L   WRITE SYSTEM ID

**  SELECTION:
```

HL2


A TAPE 1
B TAPE 2
C TAPE 3
D DISK 00
E DISK 01
F DISK 02
G DISK 03
H PRINTER
** SELECTION:

HL3


A TAPE 1
B TAPE 2
C TAPE 3
D DISK 00
E DISK 01
F DISK 02
G DISK 03
H PRINTER
I MEMORY TEST
J DATA/SCOPE
** SELECTION:

HL4

```
A    READ
B    PREP
C    READ/VERIFY
D    WRITE/VERIFY

**   SELECTION:
```

HL5

```
A    24 SECTOR
B    12 SECTOR
C    36 SECTOR

**   SELECTION:
```

HL6

```
A    RIPPLED PATTERN
B    RPT 1 CHAR
C    DMP MEM
D    DMP DCB
E    1 LINE/CHAR

**   SELECTION:
```

HL7

```
A    80 COL
B    132 COL
C    160 COL

**   SELECTION:
```

HL8

```
1XX – TAPE 1      X0X – UNIT 0      XX0 – 9/800
2XX – TAPE 2      X1X – UNIT 1      XX1 – 9/1600
3XX – TAPE 3      X2X – UNIT 2      XX2 – 7/CHAN (ODD)
                  X3X – UNIT 3      XX3 – 7/CHAN (EVN)

CURRENT ASSIGNMENTS:  100   201   302

ENTER 3-DIGIT ASSIGNMENT: _ _ _
```

HL9

```
(HIT REL TO CONTINUE)
ERROR ID:  071010

DIA       DIB       DIC       UNIT
004101    010174    070000    000000

DOA       DOB       DOC       CODE
000050    015700    000000    000022

ENTER P TO PRINT, D TO DISPLAY DCB,
OR, T TO TERMINATE, S TO SET NEW PSWS
```

ER1

```
(HIT REL TO CONTINUE)
ERROR ID:  071011

ADDR      WAS       SHB       UNIT      CODE
015600    146334    154064    000000    000000

ENTER P TO PRINT, D TO DISPLAY DCB,
OR, T TO TERMINATE, S TO SET NEW PSWS
```

ER2

```
DCB AT:  012100
(HIT REL TO CONTINUE)

.PDL:  012111

PDL ENTRIES:  (WORDS 01–20 OF THE DCB)

000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000
```

DCB1

```
DCB AT:  012100
(HIT REL TO CONTINUE)

REMAINING DCB ENTRIES:  (WORDS 21–70)

000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
000000   000000   000000   000000   000000
```

DCB2

PROGRAM DESCRIPTION FOR PROGRAM – TAPDA

Abstract:

TAPDA is a tape diagnostic and acceptance program designed to test the operability of the 9/800, 9/1600, 7/800, 7/556 and 9/556 bpi tape controllers and recording media.

Operating Procedure

1. Load TAPDA into memory per load procedure given at the start of the Diagnostics Section of the Field Engineering Reference Manual.
2. The program will halt at 1002_8.
3. Set desired switch options.
4. Mount a scratch tape on the drive to be tested.
5. Depress "continue".

A pass counter will be displayed at the end of each complete pass.

Switch Settings

All switches are down for normal operation.

Switch 0 up	Halt after error.
Switch 1 up	Do not print error information.
Switch 2 up	Loop on current test.
Switch 3 up	Loop on error.
Switch 4 up	Run tape acceptance.
Switch 5 up	Do not print pass counts.
Switch 6 up	1600 bpi tape to be tested.
Switch 7 up	7/800 tape to be tested.
Switch 8 up	7/556 tape to be tested.
Switch 9 up	Do not print progress messages.
Switch 10 up	Old controller – (P/N 1070-1).
Switch 11 up	Execute "DATA-LATE" Test.
Switch 12 up	9/556 tape to be tested.
Switch 13 up	Unit number.
Switch 14 up	Unit number.
Switch 15 up	Unit number.

NOTES:

1. If an old NOVA is being used, change location 50_8 to a non-zero value.
2. If a 12.5 ips drive is being used, change location 51_8 to a non-zero value.
3. If an even parity drive is being used, change location 52_8 to a non-zero value.
4. Switch 12 up for 9/556 tape only applies to TESLA and ARITMA tape controllers.

TAPDA
STANDARD HALTS FOR THE
TAPE DIAGNOSTIC ACCEPTANCE PROGRAM

Halt No.	
022002	Tape status in error. AC1 contains status. AC0 contains expected status.
022003	IORST issued and the SELB line failed to be sensed properly. Check SELB line to be at Level 1 (SKPBN instruction failed).
022004	IORST issued and the SELB line failed to be sensed properly. Check SELB line to be a Level 1 (SKPBZ instruction failed).
022005	NIOC issued and the SELD line failed to be sensed properly. Check SELD line to be a Level 1 (SKPDN instruction failed).
022006	NIOC issued and the SELD line failed to be sensed properly. Check SELD line to be a Level 1 (SKPDZ instruction failed).
022007	NIOC issued which should clear the command register. AC0 contains the diagnostic flags which were read out.
022010	NIOC issued which should clear address register. AC0 contains the bits that were read back from the address register; they should all be zero.
022011	Command register loaded with all ones, read back and the data did not compare. AC1 contains the bits read back (only checking bits 0–1). If they should both be a 1, it is an error.
022012	Command register loaded with all zeros. AC1 contains the bits read back. If the result is zero, it is an error.
022013	TCU address register loaded with all ones, clear pulse was issued to all other devices and after each clear pulse the TCU address register was checked and should not have been affected by the clear pulse. AC0 contains the code of the device that was issued the clear pulse.
022014	TCU address register loaded with all ones, a clear pulse was issued to the TCU and the address register was not cleared. AC0 contains the device code, which should be 22.

Halt No.	
022015	Command register loaded and read back. AC1 contains the bits that were read out of the command register (only checking bits 0–1); they should not both be on.
022016	Wrong bit loaded into command register. AC1 contains the correct bit that should have been loaded.
022017	An extra bit was read out of the command register.
022020	Address register loaded with all ones and read back all zeros. Register was probably never loaded properly. AC0 contains what was read back.
022021	Address register loaded with ones then loaded with zeros. AC0 contains the bits that were left on after the register was loaded with zeros.
022022	Address register loaded and unloaded and the two values did not match. AC0 contains the data that was loaded into the address register, and AC1 contains the data that was read out of the register.
022023	Rewind started and the rewind status bit was never sensed. AC1 contains TCU status bit 2 should be set.
022025	Rewind started and finished but tape unit never came ready (tape not rewinding or not ready).
022026	Erase started and RUN flop never set.
022027	Erase started but there was no tape movement.
022030	Tape at BOT which should keep the Delay Counter reset, but it is still running.
022031	SIB (SIN) not set for erase.
022032	Erase started but SIB (SIN) was reset too early for the erase.
NOTE:	SIB – refers to the delay if we start at the beginning of tape. SIN – refers to the dealy if we start from any place other than at the beginning of tape.
022033	Tape delay counter is not running for an erase.
022034	Tape delay was too short for an erase.

Halt No.	
022035	Erase started but there was no tape movement.
022036	Tape delay too long for an erase.
022037	IORST issued and the Delay Counter is still running.
022040	SIB (SIN) reset too late for an erase.
022041	Write command started and there was no tape movement for the write.
022042	Busy failed to set after a start pulse (SKPBN failed).
022043	Busy set but SKPBZ failed.
022044	SIB (SIN) did not set for a write.
022045	Delay counter should not be running.
022046	SIB (SIN) reset too early for write.
022047	SIB (SIN) reset too late for write.
022050	Write operation was started and should have been completed but the drive is still busy after the write.
022051	Write operation completed but the RUN Flop is still set after a write.
022052	Write operation completed, status check and Data Late was set for a write.
022053	Length Counter is counting too fast.
022054	Length Counter is not counting.
022055	Backspace operation started and there was no movement of tape for the backspace.
022056	Drive did not come ready after backspace.
022057	Five records have been written on tape and a backspace operation started and we are at BOT, there is no gap or no data on tape.
022060	No gap detected between records on a read operation.
022061	Read operation completed and status checked and Data Late was set.

Halt No.	
022062	Read operation completed and the Length Counter not correct for the read.
022063	Write operation complete and we are still at BOT, no movement of tape for a write operation.
022064	Parity error detected after a write operation.
022065	LRC error detected after a write operation.
022066	Parity error detected after a read operation.
022067	CRC error detected for a read operation.
022070	LRC error detected for a read operation.
022071	Halt to allow User to examine buffers.
022072	Ten records of zeros were written and then erased. Two records read back and the erase had failed to erase those records.
022073	Parity check logic failed.
022074	LRC check logic failed.
022075	CRC check logic failed.
022076	A record with a CRC of 0 checked and failed (zero CRC failed).
022077	A record with a non-zero CRC checked and failed (NONZERO CRC failed).
022100	An EOF was written and read back and the EOF was not there (write EOF failed).
022101	An interrupt occurred without Done being set.
022102	A write operation completed and no interrupt occurred when the operation was completed.
022103	Done cleared itself after an interrupt. The operation was completed and an interrupt occurred and interrupts were enabled again without Done being cleared. Another interrupt should have occurred and did not.
022104	A start pulse was issued and it did not clear out the interrupts.

Halt No.	
022105	An interrupt generated and a clear pulse issued and interrupts were not cleared out.
022106	IORST did not clear interrupts.
022107	This error Halt is in a separate section which must be manually run, which checks that the Data Late Indicator works by Halting in the middle of a write to prevent a Data Channel Request from occurring. Set front panel switches to 3711 and hit start, when the program stops press continue and if the Data Late bit did not set this error will occur. But if the test was OK, you will HALT at location 3737, press continue to do the test over.
022110	Backspace over BOT should have set the Illegal Indicator Bit (3) in the status word and did not.
022111	An illegal command sent to TCU and did not set the Illegal Command status bit.
022112	Start pulse issued during the execution of another command does not set Illegal Command status bit.
022113	EOT found and two backspaces does not clear EOT Indicator status bit.
022114	EOT found and a rewind does not clear EOT Indicator status bit.
022115	EOT Indicator failed. A Halt will occur at location 4107 to allow User to put tape back on reel; press continue when ready and try test over again.
022116	An unknown Interrupt occurred; AC0 contains the device code of the culprit.
022117	Error; a spurious tape interrupt occurred.
022120	Zero LRC indicator not set with zero LRC (Tesla/Aritma)
022121	Zero LRC indicator set with non-zero LRC (Tesla/Aritma)

ADDING PROGRAMS TO THE DIAGNOSTIC TAPE

Use the following procedure to add a Program to the end of the programs on a Diagnostic Tape. The time needed is approximately 10 minutes.

1. Mount the Diagnostic Tape and make it ready.
2. Load PATCH (program 1).
3. When PATCH is loaded, stop the CPU and Change:
   a) LOCATION 002627 from 004164 to 014062
   b) LOCATION 002630 from 024405 to 020062
   c) LOCATION 002631 from 030405 to 040377
4. Set the data switches to 0010000 and depress "START".
5. Select the proper tape and disk assignments (if necessary).
6. Select the Rewind option.
7. Select the Load option.

7.5 Select the Rewind option after load.

8. Dismount the Diagnostic Tape.
9. Stop the CPU and make the following changes:
   a) LOCATION 001217 from 006775 to 000401
   b) LOCATION 002525 from 102400 to 020377
   c) LOCATION 002527 from 040054 to 000401
   d) LOCATION 002530 from 020114 to 020127
   e) LOCATION 002645 from 102400 to 020377
   f) LOCATION 002647 from 040064 to 000401
10. Set the data switches to 001040 and depress "START".
11. Mount and make ready the Tape containing the program(s) to be added.
12. Select the Load option.
13. When the Load is completed, rewind and dismount the Tape.
14. Mount and make ready a scratch tape.
15. Select the Dump option. This tape will contain all programs including the added ones.

To add programs from more than one tape, repeat steps 11 - 13 for each additional program tape to be added.

PROGRAM DESCRIPTION FOR PROGRAM – MEM06

Abstract:

MEM06 is a memory diagnostic program designed to exercise core memory locations as selected by the operator. MEM06 contains 5 individual tests and a component checking section. The tests are as follows:

TEST1 – Write Zeros

This test will write and verify a word of zeros to all tested locations.

TEST2 – Write Ones

This test will write and verify a word of ones to all tested locations.

TEST3 – Slide 1's and 0's

This test will write and verify a data pattern of all zeros with one bit set to all tested locations. The one bit will be moved to the next bit position and this pattern will be used. When all 16 bit positions have been tested in this way, the pattern will be changed to all ones with a zero bit. This pattern will be used for all tested locations. Then, the zero bit will be moved to the next bit position and this pattern will be used. All 16 bit positions are used.

TEST4 – Addressing Test

This test will write the address of each tested location in that location and check all other locations to see that double addressing did not occur.

When all locations are tested, the logical complement of each location's address is used.

TEST5 – Disk/Memory Interaction

This test writes a record on cylinder 202 of the disk and reads it back into the tested memory area and verifies the data. All tested locations are used as the starting read-in address. At least 128 words must be allocated to the test.

Component Check Section

The component check section will be run only if selected (Switch 4 up) and then only if exactly 8K of memory (starting with the first location of an 8K board) is selected to be tested.

The component check section will check a failing memory for failure patterns that are caused by specific components or logic groups. That component or logic group will be called out on the display device.

Operating Procedure

1. Load MEM06 into memory per procedure in the Field Engineering Reference Manual.
2. The program will display the revision number and the memory locations found to be available for testing.
3. When the program halts, enter the high and low memory limits desired, into AC0 and 1. They are pre-set to the available limits.
4. Select the program switches desired and depress "continue".
5. The program may be restarted by raising Switch 6.

Switch Settings

All switches are down for normal operation.

Switch 0 up	Halt after error.
Switch 1 up	Do not print error information.
Switch 2 up	Loop on current test.
Switch 3 up	Loop on error.
Switch 4 up	Run the component check section.
Switch 5 up	Do not print pass counts.
Switch 6 up	Restart program.
Switch 7 up	Do not print progress messages.
Switch 8 up	Run a specific test.
Switch 9 up	Write to each location 1000 (decimal) times. (Default is 1 time)
Switch 10–15	Test number to be run (See Switch 8).

Miscellaneous

1. The test runs approximately 20 minutes.

2. The loop on error function (Switch 3) will cause the program to loop until Switch 3 is lowered or the location does not fail.

DIAGNOSTIC TAPE MAINTENANCE – PCHO1

Abstract:

PCHO1 is a program used to copy diagnostic tapes, patch diagnostic programs or convert diagnostic tapes from one recording mode/density to another.

The program loads the diagnostic program tape onto the disk unit. Patch information is then optionally entered from a DATA/SCOPE (with the printer and/or teletype optionally used as hard-copy devices). When program corrections are completed, the information may be dumped onto tape.

Operating Procedure:

1. Load PCHO1 as you load any other diagnostic program.
2. When PCHO1 is loaded, depress the slash (/) key on any keyboard.
3. A HELP List will be displayed requesting the option you want. (See Note 3 on page 9–103).
4. Select options by depressing the letter preceding the option desired.

The options are as follows:

A – TAPE TO DISK — Will read diagnostic programs from tape and write them on the disk. The operation will continue until a tape mark is detected. (When this operation is completed, the programs may be loaded from the disk.)

B – DISK TO TAPE — Will read diagnostic programs from the disk and write them onto tape. (A tape mark is written and a backspace done after each program is written to tape.)

C – PATCH PROGRAMS — Will accept patch information from the DATA/SCOPE and apply it to a program on the disk. Entering a question mark (?) when the message "ENTER PATCH DATA OR ?" is displayed will cause the patch information format to be displayed. Entering FIELD RELEASE without any data will return control to the first HELP List.

D – ASSIGN NEW TAPE — Will allow a tape other than a 9/800 tape to be used as input/output.

E – BACKSPACE TAPE Will issue a backspace command to tape.

F – ADD PROGS TO DISK Will read diagnostic programs from tape and add them to the end of the programs already on the disk.

G – REWIND TAPE TO BOT Will issue a rewind command to tape.

H – WRITE TAPE MARK Will write an IBM-compatible EOF record to tape.

I – ASSIGN HARD COPY DVC Will accept an option from the operator to display all further DATA/SCOPE – operator communications on the printer and/or TTY.

J – FORWARD SPACE TAPE Will issue a read command to tape.

NOTES:

1. The program requires 16K to load/dump 9/800 or 9/1600 tapes.
2. The program requires 24K to load/dump 7-channel tapes.
3. If loading all diagnostics to Disk, do not omit to rewind the tape before commencing the 'tape to disk' operation.

TAPE TO PRINTER – TPPR1

Abstract:

TPPR1 is a maintenance utility program written to print the assembly listings and linkage memory maps for diagnostic programs from a DOS dump file tape.

Operating Procedure:

1. Load TPPR1 into memory.
2. The switch options will be displayed on the DATA/SCOPE.
3. When the CPU halts at address 2110_8, set the desired switch settings and depress continue.
4. The program listings and memory maps will be printed and each listing and map name will be displayed on the DATA/SCOPE.
5. When the last file has been processed, the message "PROGRAM COMPLETED" will be displayed.

Switch Settings:

Switch 0 up	HALT and accept switch options.
Switch 1 up	Display next record on the DATA/SCOPE.
Switch 2 up	Skip next nn records.
Switch 3 up	Skip next nn pages.
Switch 4 up	Skip next nn programs.
Switch 5 up	Do not rewind input tape.
Switch 8–15	BCD value for nn (above) – 00–99.

NOTES:

1. The tape is a 9/800 bpi, unit 0. A unit number other than zero may be used by changing address 000050_8 to reflect the unit number.
2. If the printer is not on line when the program is started, it will not be used.

DISK DIAGNOSTIC, EXERCISER, AND ACCEPTANCE TEST – DSKDA

Abstract:

DSKDA is a combination of a diagnostic test, acceptance test, and an exerciser. Any of the three may be selected by a switch option. A description of each follows.

DIAGNOSTIC Section

The Diagnostic section is designed to check the proper operation of the logic of the disk controller. It is made up of six segments:

I.	NIOC Test	–	Checks the ability of the controller to clear the BUSY and DONE flops.
II.	IORST Test	–	Verifies that an IORST will be accomplished within two seconds.
III.	ADDRESS REGISTER Test	–	Loads and unloads the address register with various patterns.
IV.	ILLEGAL OPERATION Test	–	Verifies that an illegal op-code will be properly handled.
V.	I/O Test	–	Verifies the operability of the read, write, check, data-late, and data-check operations.
VI.	INTERRUPT Test	–	Checks the Interrupt control logic.

ACCEPTANCE Section

This section will test the recording surface and mechanical reliability of the disk unit. All surface areas are randomly written to, and read from, and the data verified some time within one complete pass.

EXERCISER Section

This section accepts a command from the F.E. (via the front panel switches) and repeatedly executes it until a new command is requested.

Switch Settings

The switches are read and interpreted as follows:

a) When first starting DSKDA:

SW4	Up	Run the acceptance section.
SW6	Up	Run the exerciser section.
SW4 & SW6	Both Down	Run the diagnostic section.
SW14, 15		Unit #
SW13	Up	Run all disk drives up to and including those specified on SW14 & SW15 (acceptance section only)
SW13	Down	Run only those disk drives specified on SW14 & SW15.

b) During the diagnostic section operation:

SW0	Up	HALT on error.
SW1	Up	Do not print errors.
SW2	Up	Loop on test.
SW3	Up	Loop on error.
SW5	Up	Do not print pass #.
SW9	Up	Print progress messages.

c) During the acceptance section operation:

SW7	Up	Display accumulated errors now.
SW8	Up	Terminate this pass. A new pass will be started when SW8 is lowered.
SW9	Up	Print progress messages.
SW11, 12		Data pattern select:
0, 0		ID, HSA, HSA NEGATED, HSA, etc.
0, 1		ID, RAND # + 1, RAND # + 2, etc.
1, 0		ID, Random data.
1, 1		ID, All 1's.
		The ID is the HSA, BFA, and RAND #.

d) At the start of the exerciser section:

SW0	Up	HALT and accept new switch settings.
SW1	Up	WRITE to disk instead of read.
SW2, 3		Mode (0–2).
SW4	Up	Repeatedly execute a seek to the address contained in the switches followed by an IORST.

e) During the exerciser section and when SW0 is down (after having been raised at least once).

SW0	Up	HALT and accept a new command.
SW1–15		Seek address (DOC command word).

Operation of the Diagnostic Section:

This section is selected by leaving switches 4 and 6 down when requested after loading or restarting DSKDA. Switches 14 and 15 are set to the unit number, at this time, also.

The progress of the test may be followed by raising switch 9.

At the end of each pass, the pass number and mode in use will be displayed.
If a 2-bay system is being used, location 50 should be changed to a non-zero value.

Operation of the Acceptance Section:

To invoke the acceptance section, raise switch 4, set switches 14, 15 to the unit number, and depress CONTINUE when requested after loading or restarting DSKDA. While running the acceptance section, the following switches will be checked for at the termination of each I/O operation:

Switch 7 Will cause the errors that have been accumulated during this pass to be displayed. After the display, the accumulated error counters are reset and the test continues. If no errors have been accumulated, no action will be taken.

Switch 8 Will terminate the current pass and display the accumulated errors. The program will then wait for Switch 8 to be reset and then will start a new pass.
If a 2-bay system is being used, location 50 should be changed to a non-zero value.

Operation of the Exerciser Section:

To start the exerciser section, set switches 14 and 15 to the unit number, set switch 6 and depress CONTINUE when requested after loading or restarting DSKDA.

Initially, the program will loop until switch 0 is raised. The program then halts waiting for a command to be entered in switches 1–4. When CONTINUE is then depressed, the program loops, waiting for switch 0 to be lowered. When it is, the front panel switches are read and used as the seek address for the operation selected. Repeatedly, the operation is done and switches are read until switch 0 is raised again. At that time, a HALT is done waiting for a new command to be entered into switches 1–4.
If a 2-bay system is being used, location 50 should be changed to a non-zero value.

Halt No.	
032001	BUSY not cleared by NIOC.
032002	DONE not cleared by NIOC.
032003	ESR not zero (AC0 CONTAINS ESR INFO).
032004	BUSY not cleared by NIOC.
032005	DONE not cleared by NIOC.
032006	IORST did not cause bit 0 or bit 4 (drive not ready) to set. AC1 has expected ESR, AC0 has received ESR.
032007	IORST issued after 2 second wait failed to reset ESR. AC0 has received ESR.
032010	Address register did not load or unload properly. AC0 has the data sent and AC1 has the data received.
032011	Illegal operation (MODE = 3) sent to controller and the "UNUSUAL END" and "INVALID COMMAND" bits did not both get set. AC0 has ESR received, and AC1 has ESR expected.
032012	BUSY is not reset or DONE is not set after ILLOP sent to controller.
032013	NIOC did not clear ESR. AC0 has ESR received.
032014	NIOC did not clear BUSY.
032015	NIOC did not clear DONE.
032017	Time out error. Device did not complete a write operation within 2 seconds.
032020	ESR not zero after a write operation (AC2 has disk address, AC0 has ESR).
032022	Time out error. Device did not complete a read operation within 2 seconds.
032023	ESR not zero after a read operation (AC2 has disk address, AC0 has ESR).
032024	Data non-compare. A word in the read-in buffer did not compare with the expected data. AC1 has the expected data word. AC0 has the data word read into memory. AC2 has the address.

Halt No.	
032025	'DATA LATE' not set when expected. A write operation was started. Then, a long indirect addressing loop was entered. When completed, the DATA LATE bit should have been set (AC0 = ESR).
032026	Same as Halt No. 032025 except that a read operation is used.
032027	Time out error. The operation did not complete within 2 seconds. AC0 has the op-code sent to the controller. AC1 has the I/O address sent, and AC2 has the disk address sent.
032030	"DATA-CHECK" not set after a bad record is written, then read back. AC0 has ESR received, AC1 has ESR expected, AC2 has disk address sent.
032031	Interrupt detected when none expected.
032032	No immediate interrupt after an illegal command was sent to the controller. AC0 has op-code sent.
032033	The interrupt that was caused by sending an illegal operation to the controller was cleared without explicit clear from the processor.
032034	Device code of interrupting device is not the same as that of the disk. AC0 has interrupting device's device code and AC1 has expected device code.
032035	Interrupting device code was cleared by executing 2 "INTA" commands. AC0 has the device code gotten by the second "INTA".
032036	Interrupt received when none expected. Only the disk was allowed to interrupt and, at this time, no interrupt should be present.
032037	Pending disk interrupt was not taken when the interrupt mask was set to 000013.
032040	'NIOC' failed to clear interrupt conditions and an interrupt occurred.
032041	"INTA" instruction produced a non-zero result following execution of a "NIOC" instruction. AC0 has device code present.
032042	Memory failure. AC0 has expected data, AC1 has the data found and AC2 has the address.
032043	Unknown device interrupted. AC0 has device code.
032044	Disk interrupted when not expected.
032045	Unrecognizable status error. AC0 = ESR.
032046	Disk not ready. AC0 = ESR.

Halt No.	
032047	Invalid mode found. AC0 = ESR.
032050	Overwrite protection error. AC0 = ESR.
032051	Write check error. AC0 = ESR.
032052	Seek incomplete. AC0 = ESR.
032053	Invalid cylinder. AC0 = ESR.
032054	I/O buffer mismatch. 8 words are displayed: Word 1 = Actual data word found. Word 2 = Data expected. Word 3 = Address. Word 4 = Return address. Word 5 = HSA in the I/O buffer. Word 6 = Address data was written from. Word 7 = Address data was read into. Word 8 = Octal number of words in error.

BIG DISK

33/66 Megabyte Disk Test – Disk 1

DISK1 is a diagnostic program containing diagnostic, acceptance, surface preparation, and exerciser sections. The test is written to be run on a system containing a 33/66 megabyte disk drive.

There are four (4) sections:

Diagnostic Section:

The Diagnostic section is designed to check for the proper operation of the disk controller. The CPU interface, controller to drive interface, and error detection logic are tested in this section. This section takes about 3 minutes/pass.

Acceptance Section:

The Acceptance section will randomly write and verify (by reading back) all surface areas of the disk. This section takes about 2½ hours/pass on a 33 megabyte disk.

Surface Preparation:

The Surface Preparation section will write sequentially and verify all surface areas of the disk. This section takes about 10 minutes/pass on the 33 megabyte disk.

Exerciser Section:

The Exerciser section accepts commands from the F. E. (via the front panel switches) and repeatedly executes them until a new command is requested.

Switch Settings:

The switches are read and interpreted as follows:

a) Acceptance, Diagnostic, and Surface Preparation sections:

SW0 . . . up . . . halt on error
SW1 . . . up . . . inhibit error display
SW2 . . . up . . . loop on current test
SW3 . . . up . . . loop on error
SW4 . . . up . . . do next test when SW4 is lowered
SW5 . . . up . . . do not display pass #
*SW6 . . . up . . . run Acceptance section
*SW7. . . . up . . . fun Exerciser section
*SW8 . . . up . . . run Surface Preparation section
(SW6–8 . . . down . . . 64 sector mode)
SW9 . . . up . . . display progress messages
*SW10. . . up . . . 16 sector mode
*SW11. . . up . . . 32 sector mode
(SW10, 11 . . down . . 64 sector mode)
SW12, 13 . . . . . data pattern selection
0 0 . . . . . random data
0 1 . . . . . alternate words of 1's and 0's
1 0 . . . . . alternate bits of 1's and 0's
1 1 . . . . . all 1's
SW14, 15 . . . . . unit number

*These switches are only checked at the start of DISK1.

b) At the start of the Exerciser section:

SW0. . . up . . halt and accept options
SW1. . . up . . write 1's
SW2. . . up . . write alternate bits of 1's and 0's
SW3. . . up . . sequential forward seeks to limit
SW4. . . up . . sequential reverse seeks from limit
SW5. . . up . . seek to 0 then to limit
SW6. . . up . . direct seek to limit
SW7. . . up . . direct seek to limit then IORST
SW8. . . up . . random seeks within the limit
SW9. . . up . . read instead of verify
SW10–15. . . sector number to be used

c) While running the Exerciser section:

SW0 . . . up . . go to start of Exerciser
SW1–5 . . . . . HEAD number
SW6–15. . . . . CYNLINDER number

(The HEAD and CYLINDER entered is used as the limit)

Operation of the Diagnostic Section

The Diagnostic section is selected by leaving switches 6–8 down at the start of DISK1. At the end of each pass, a pass number will be displayed.

Operation of the Acceptance Section

The Acceptance section is selected by raising switch 6 at the start of DISK1. At the end of each pass, a pass counter will be displayed. If switch 9 is raised, a loop counter will be displayed after all cylinders have been written and verified using one sector and head number.

Operation of the Surface Preparation Section

The Surface Preparation section is selected by raising switch 8 at the start of DISK1. The program will write to every 11th sector on the first cylinder/head. Then, every 11th sector on the first cylinder/head will be verified. The heads and cylinders are written to and verified sequentially. At the end of this section, a program restart is done (without the initial HALT).

Operation of the Exerciser Section

The Exerciser section is selected by raising switch 7 at the start of DISK1 and depressing CONTINUE.

Initially, the program will loop until switch 0 is raised. The program then HALTS waiting for options to be selected in swtiches 1–15. When CONTINUE is then depressed (switch 0 is still raised), the program saves the option information and loops, waiting for switch 0 to be lowered. When it is, the front panel switches are read and used as the seek address for the operation selected. Repeatedly, the operation is done and switches are read until switch 0 is raised again. At that time, a HALT is done waiting for new options.

Miscellaneous

Data Patterns Used:

When a write is done in any section of the DISK1 program, the following information is contained in the output buffer:

SW12	SW13	WORDØ	1	2	3	4	5	6	7
Ø	Ø	RAND#	RAND#	DOC	DOA	DOB	RND1	RAND#	RAND#
Ø	1	177777	000000	DOC	DOA	DOB	RND1	177777	000000
1	Ø	125252	052525	DOC	DOA	DOB	RND1	125252	052525
1	1	177777	177777	DOC	DOA	DOB	RND1	177777	177777

STANDARD HALTS FOR DISK1

PROGRAM ID 033

000 . . . Unexpected interrupt. C(AC0) = device code; C(AC2) = P–CTR

001 . . . NIOC failed to reset BUSY

002 . . . NIOC failed to reset DONE

003 . . . "S" failed to set BUSY

004 . . . "C" failed to reset BUSY

005 . . . BUSY set when device 00 was selected

006 . . . "CYL SYNC" not 0 after "S"

007 . . . Address register loaded incorrectly. C(AC0) = WAS; C(AC1) = SHB

011 . . . Status register incorrect after IORST. C(AC0) = WAS; C(AC1) = SHB

012 . . . Bit 7 of the ending status register (Invalid) did not set when an operation using Mode=3 was requested. C(AC0) = ESR; C(AC2) = command issued

013 . . . Bit 7 of the ESR not reset by valid command. C(AC0) = ESR; C(AC2) command issued

014 . . . Bit 7 of the ESR (Invalid) did not set when an op-code of 2 was requested. C(AC0) = ESR; C(AC2) = command issued

015 . . . Bit 15 of the ESR not reset by a valid command. C(AC0) = ESR; C(AC2) = command issued

016 . . . Bit 2 of the ESR (Seek Incomplete) did not set when a cylinder number that was too high was sent to the drive. C(AC0) = ESR; C(AC2) = DOC word sent

017 . . . "P" did not reset bit 2 (Seek Incomplete). C(AC0) = ESR; C(AC2) = DOC issued

020 . . . IORST failed to set bit 4 (Drive Not Ready) of ESR. C(AC0) = ESR

021 . . . "S" failed to reset bit 4 (Drive Not Ready) of ESR. C(AC0) = ESR; C(AC2) = command sent

022 . . . Busy did not reset within about 72ms of the start of a WRITE operation C(AC0) = ESR; C(AC1) = Address Register; C(AC2) = Buffer address

023 . . . Status error on write operation. C(AC0) = ESR; C(AC1) = Address register

024 . . . Address register incorrect at completion of a write. C(AC0) = ESR; C(AC1) = Address register; C(AC2) = starting address

025 . . . Busy did not reset within about 72ms of the start of a READ operation. C(AC0) = ESR; C(AC1) = Address register; C(AC2) = Buffer address

026 . . . Status error after READ operation. C(AC0) = ESR; C(AC1) = Address register

027 . . . Address register incorrect at completion of a READ. C(AC0) = ESR; C(AC1) = Address register; C(AC2) = Starting address

030 . . . I/O buffer mis-compare. 11 words are displayed

Word 1 = word from output buffer (BUF–A)
Word 2 = word from input buffer (BUF–B)
Word 3 = Address of BUF–A
Word 4 = Return address
Word 5 = Address of bad word in BUF–A
Word 6 = Address of bad word in BUF–B
Word 7 = Address of BUF–B
Word 8 = # words in error (octal)
Word 9 = Cylinder read from
Word 10 = Head read from
Word 11 = SECTOR read from

031 . . . An interrupt occurred when masked off. C(AC0) = ESR; C(AC1) = Address register; C(AC2) = device code of interrupter

032 . . . No interrupt from write operation. C(AC0) = ESR; C(AC1) = Address register; C(AC2) = status of DONE and BUSY in bits 14 and 15 (1=set)

033 . . . Wrong device code on interrupt. C(AC0) = ESR; C(AC1) = address register; C(AC2) = devide code of interrupter

034 . . . Status error after a write operation. C(AC0) = ESR; C(AC1) = Address register

035 . . . Incorrect final address after a write operation. C(AC0) = ESR; C(AC1) = Address register

036 . . . An interrupt occurred when masked off. C(AC0) = ESR; C(AC1) = Status of DONE and BUSY in bits 14 and 15 (1=set); C(AC2) = device code of interrupter

037 . . . No interrupt from a write opeation. 8 words are displayed:

Word 1 = DOA word issued
Word 2 = DOB word issued
Word 3 = DOC word issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = Status of DONE and BUSY in bits 14 and 15
Word 8 = Not used

040 . . . Status error after a WRITE operation. 8 words are displayed:

Word 1 = DOA word issued
Word 2 = DOB word issued
Word 3 = DOC word issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = DONE and BUSY status in bits 14 and 15
Word 8 = Not used

041 . . . Address register incorrect after a write. 8 words are displayed:

Word 1 = DOA issued
Word 2 = DOB issued
Word 3 = DOC issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = DONE and BUSY status in bits 14 and 15
Word 8 = Expected final address

042 . . . No interrupt from a READ operation. 8 words are displayed:

Word 1 = DOA issued
Word 2 = DOB issued
Word 3 = DOB issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = DONE and BUSY status in bits 14 and 15
Word 8 = Not used

043 . . . Status error after a READ operation. 8 words are displayed:

Word 1 = DOA issued
Word 2 = DOB issued
Word 3 = DOC issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = DONE and BUSY status in bits 14 and 15
Word 8 = Not used

044 . . . Address register incorrect after a READ. 11 words are displayed:

Word 1 = DOA issued
Word 2 = DOB issued
Word 3 = DOC issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = DONE and BUSY status in bits 14 and 15
Word 8 = Expected final address
Word 9 = CYLINDER read from
Word 10 = HEAD read from
Word 11 = SECTOR read from

045 . . . Data in read in buffer is incorrect. 8 words are displayed:

Word 1 = Word from output buffer (BUF–A)
Word 2 = Word from inptut buffer (BUF–B)
Word 3 = Address of BUF–A
Word 4 = Return address
Word 5 = Address of bad word in BUF–A
Word 6 = Address of bad word in BUF–B
Word 7 = Address of BUF–B
Word 8 = # bad words (in octal)

046 . . . Wrong device code on interrupt from WRITE. 8 words are displayed:

Word 1 = DOA issued
Word 2 = DOB issued
Word 3 = DOC issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = DONE and BUSY status in bits 14 and 15
Word 8 = Device code found

047 . . . Wrong device code on interrupt from a READ. 8 words are displayed:

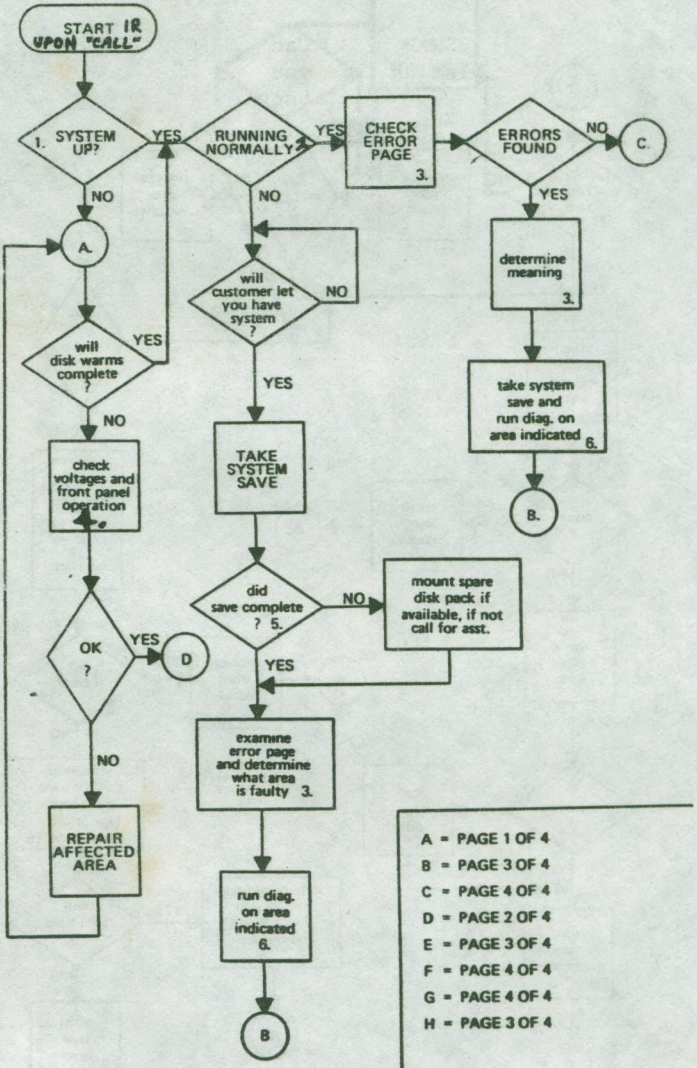
Word 1 = DOA issued
Word 2 = DOB issued
Word 3 = DOC issued
Word 4 = Return address
Word 5 = Results of DIA
Word 6 = Results of DIB
Word 7 = DONE and BUSY status in bits 14 and 15
Word 8 = Device code found

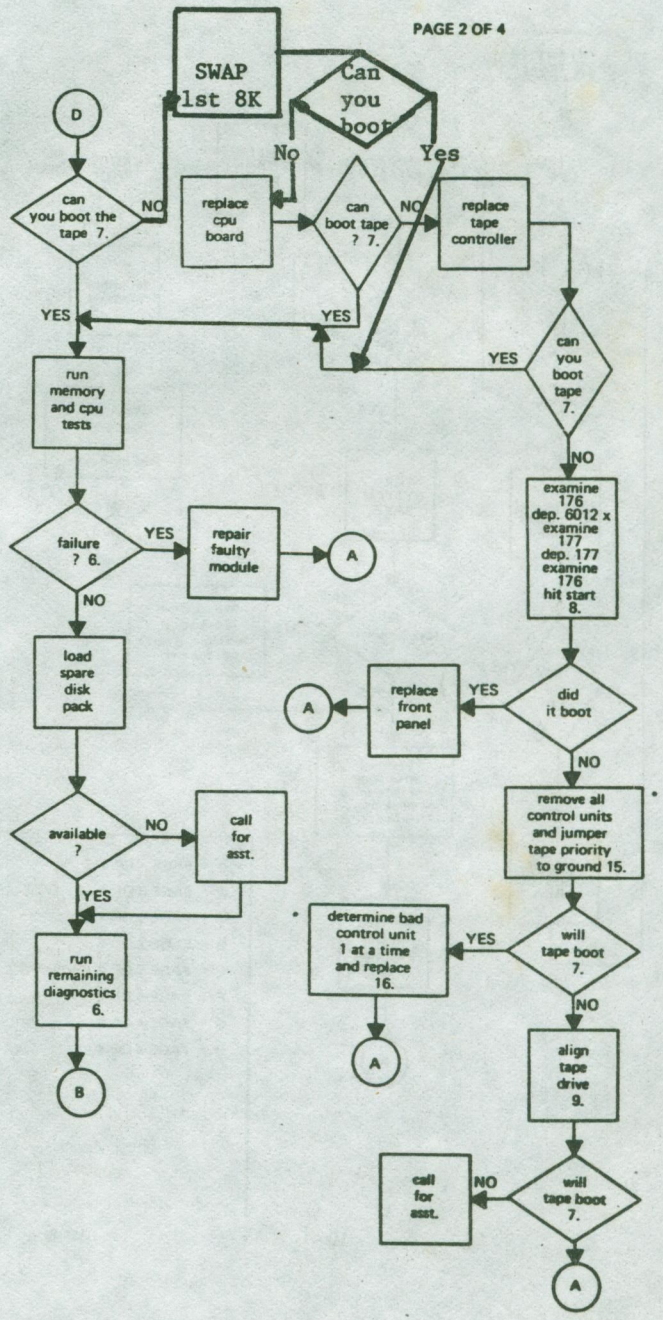
050 . . . "CYL SYNC" not Ø after 100ms. C(ACØ) = ESR; C(AC2) = calling address

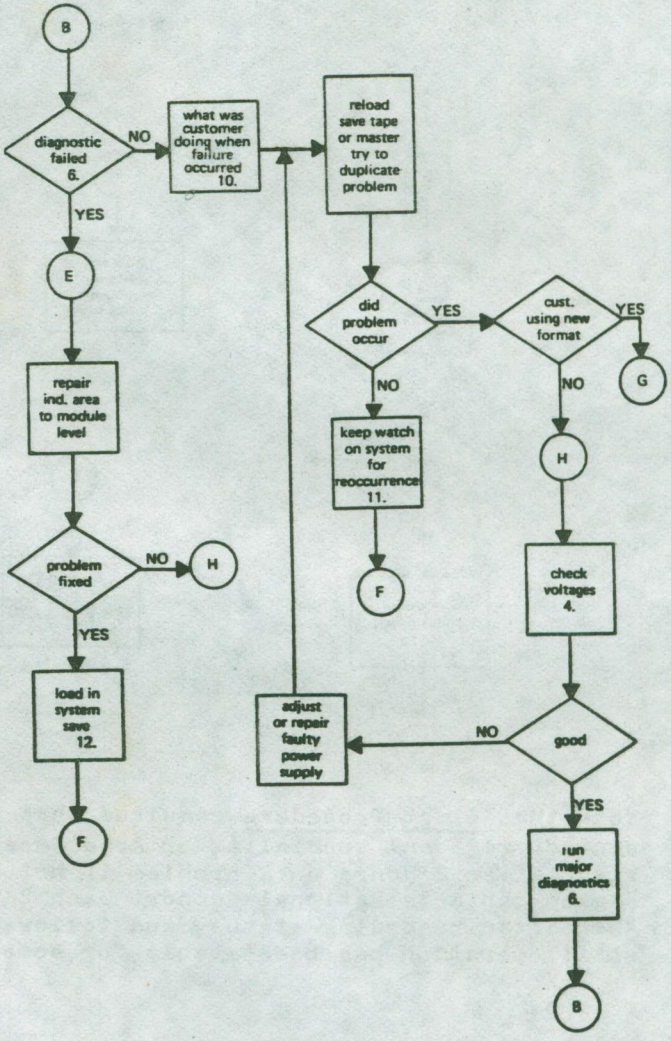
051 . . . Data in read in area is incorrect. 11 words are displayed:

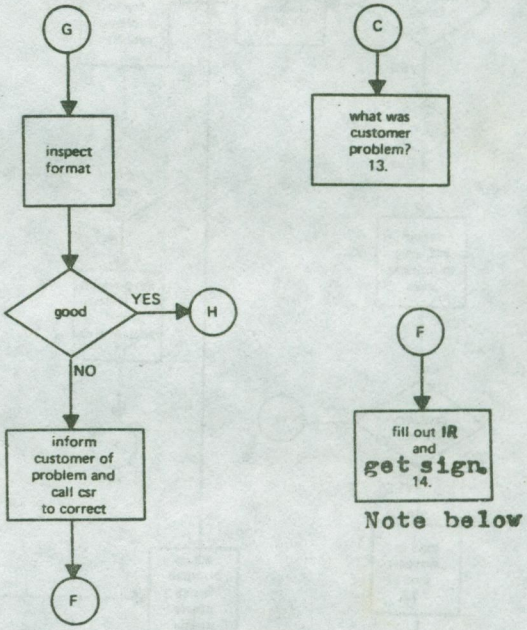
Word 1 = Word from read in area (WAS)
Word 2 = Calculated word (SHB)
Word 3 = Address of the bad word
Word 4 = Return address
Word 5 = Address of read in area
Word 6 = DOA found in read in area
Word 7 = DOC found in read in area
Word 8 = # bad words (in octal)
Word 9 = CYLINDER read from
Word 10 = HEAD read from
Word 11 = SECTOR read from

SYSTEMS TROUBLESHOOTING


START IR UPON "CALL"
1. SYSTEM UP?
YES
NO
RUNNING NORMALLY
YES
NO
CHECK ERROR PAGE 3.
ERRORS FOUND
NO
C.
YES
determine meaning 3.
take system save and run diag. on area indicated 6.
B.
A.
will disk warms complete ?
YES
NO
check voltages and front panel operation
will customer let you have system ?
NO
YES
TAKE SYSTEM SAVE
did save complete ? 5.
NO
mount spare disk pack if available, if not call for asst.
YES
OK ?
YES
D
NO
REPAIR AFFECTED AREA
examine error page and determine what area is faulty 3.
run diag. on area indicated 6.
B
A = PAGE 1 OF 4
B = PAGE 3 OF 4
C = PAGE 4 OF 4
D = PAGE 2 OF 4
E = PAGE 3 OF 4
F = PAGE 4 OF 4
G = PAGE 4 OF 4
H = PAGE 3 OF 4


SWAP 1st 8K
Can you boot
No
Yes
D
can you boot the tape 7.
NO
replace cpu board
can boot tape ? 7.
NO
replace tape controller
YES
YES
YES
can you boot tape 7.
run memory and cpu tests
NO
examine 176 dep. 6012 x examine 177 dep. 177 examine 176 hit start 8.
failure ? 6.
YES
repair faulty module
A
NO
load spare disk pack
A
replace front panel
YES
did it boot
NO
remove all control units and jumper tape priority to ground 15.
available ?
NO
call for asst.
YES
determine bad control unit 1 at a time and replace 16.
YES
will tape boot 7.
NO
run remaining diagnostics 6.
A
align tape drive 9.
B
call for asst.
NO
will tape boot 7.
A


B
diagnostic failed 6.
NO
what was customer doing when failure occurred 10.
reload save tape or master try to duplicate problem
YES
E
did problem occur
YES
cust. using new format
YES
G
NO
NO
repair ind. area to module level
keep watch on system for reoccurrence 11.
H
problem fixed
NO
H
check voltages 4.
F
YES
load in system save 12.
adjust or repair faulty power supply
NO
good
YES
run major diagnostics 6.
F
B



Note that Alert Procedure requires that you contact regional specialist or Area Supervisor after 2 hours on a problem if not fixed. Region contacts National Support each 2 hours thereafter regarding status, and follows up until operation has been stable for some time.

NOTES ON TROUBLESHOOTING FLOW CHART

1. In use on customer job(s).
2. Operators keying without encountering errors at this time and peripherals appear operable.
3. See page 10-7.A and notes beginning on 10-8.
4. Voltage and front panel checks:
   a. Check Data Channel light (DCH), Power Fail & -5V Fail lights; All should be off.
   b. Deposit and then examine 000000 in AC0-3. Deposit and then examine 177777 in AC0-3.
   c. Examine 177777, Deposit 177777 and Deposit Next 177777 twice; Examine 177777--should show loc. 077777=177777 if 32K system, and =000000 if 24K system; Examine next should show locs. 0 & 1 = 177777--i.e. PC increments. Deposit 177777 in following locs. & examine: 017776 through 020001, 037776 through 040001, 057776 through 060001; all should work on 32K system, and only 060000 to 077777 should show 000000 on 24K system. Repeat the process with 000000 as data to be sure memories are not picking up any bits.
   d. Move tape forward, on-line, then press RESET to see if reset switch works. With loc 0 = 0, press START; RUN & FETCH are lit. Press STOP; STOP & FETCH are lit. Press RESET; FETCH goes out. Press CONTINUE, LOCK Key, & STOP; RUN and FETCH are lit. Press RESET; Run and Fetch still lit. UNLOCK Key, then STOP; Fetch goes out.
   e. Check all CPU voltages according to page 1-9 or 1-13 (F.E. Ref); or check peripheral and CPU voltages according to policy number NAT-001. If SAVE completed you will be able to use the scopes, and tape will have rewound to BOT.
6. See section 9 of F.E. Ref. (Diagnostics).
7. After booting a Rel 4 diagnostic tape address = 262 (7 channel address = 015000). On Rel. 5, address = 17017.
8. Following will read one block of data without coldstart switches: /176=06012X; /177=177; X= 2 for 9/800, or 0 for 9/1600, or 3 for 7/800 or 7/556 tapes.
9. For tape drive alignments use the vendor's manual with the F.E. Ref. section first time adjusting that particular model.

10. Determine what job, and in what part of job, the customer was operating at the time of the failure.
11. Stay on the site for up to an hour if you do not have other pressing business and watch the customer operation. Keep in contact with the customer during the next day or so.
12. Have the customer try to duplicate the problem before resuming normal operations.
13. Could the error have been caused by a procedu· problem in the customer operation?
14. Reference IR procedures & section 11, F.E.R
15. Priority Jumpers -- Removal of Boards
    a. Remove all controllers, except TAPE controller.
    b. Jumper pins 94 & 96 of TAPE controller slot t< GND at pins 99 & 100.
    c. Power up and boot tape.
16. Checking of boards, one at a time.
    a. Re-insert DISK 20 board. Remove jumper from TAPE control pins 94 & 96 to 99 & 100.
    b. Power up and boot tape. If it doesn't work, replace the DISK 20 board -- it is bad. If it does work, go to "c".
    c. Insert board above TAPE controller. Boot tape. If it doesn't boot, replace that controller. Do the same for next controller, etcetera.

Release VII Field Service HELP List

THE FOLLOWING INFORMATION IS CONFIDENTIAL

In additon to the Operator's and Supervisor's HELP lists, System 480 contains a third list that is used by ENTREX PERSONNEL only(normally by Field Service and Software Support.) It is obtained by entering the password ←→ ←→ REL after selecting DIAGNOSTIC MODE from the SYSTEM OPERATIONS HELP list. It provides the following functions:

A. Display ERRORS -- A list and count of system errors, defined below.

B. CLEAR ERRORS -- A Capability to clear the count of system errors and cause them to be added to a second list that maintains a running count of errors.

C. DISPLAY CORC CNT -- A software debugging tool is provided. CORC COUNTS are of use only to the Software Development Department in Burlington.

D. DISPLAY TERM NO -- Displays the decimal number of the slot in the pre-terminal cage to which a terminal is connected.

E. GENERATE SYSTEM -- A capability to configure a system with respect to the number of disk drives (one through four); the frequency of the input current (50HZ or 60 HZ); and the core capacity of the system (24K or 32K). System Generation can only be accomplished when on a Master System Save, and will generally be done by Software Support in Burlington.

F. EXERCISE SYSTEM -- Causes a system test to be executed. The test will continue to execute until a cold start is preformed. It is recommended that EXERCISE SYSTEM be executed from a Master System Save.

G. SET PARTITION -- Allows the Customer Engineer to re-configure the system with respect to the number and type of terminals. The partition is normally set to the decimal number of Keypunch-type terminals plus one. All per-terminal cage slots with numbers greater than the partition number will be treated as Typewriter-type terminals by software.

H. DEBUG -- A software debugging program that is used for patching programs at a teletype. DEBUG is locked-out after a SYSTEM GENERATION is done.

I. READ CODE -- A software debugging program which reads software modules from disk to core for patching at a teletype. READ CODE is locked-out after a SYSTEM GENERATION is done.

J. WRITE CODE -- A software debugging program which reads software modules from core to disk after patching at a teletype. WRITE CODE is locked-out after a SYSTEM GENERATION is done.

K. WRITE WARMS -- Causes the Disk Warm Start information to be written on the disk. WRITE WARMS is locked-out after a SYSTEM GENERATION is done.

L. TYPEWRITER OVERSIGN -- Provides the software oversign option to Typewriter-type terminals in additon to Keypunch-type terminals.

DISPLAY ERRORS

In Release VII, selecting DISPLAY ERRORS causes two pages of information to be displayed:

The first page contains a current count of system errors; the second page maintains a running count of system errors until a Master System Save is cold-started.

Each page contains 24 error count accumulators. Each error count accumulator is assigned a decimal number from one to 24. The accumulators are read from left-to-right order; e.g., the accumulator in the first line, last column is accumulator number five, second line, first column is accumulator number six, etc.

CLEAR ERRORS

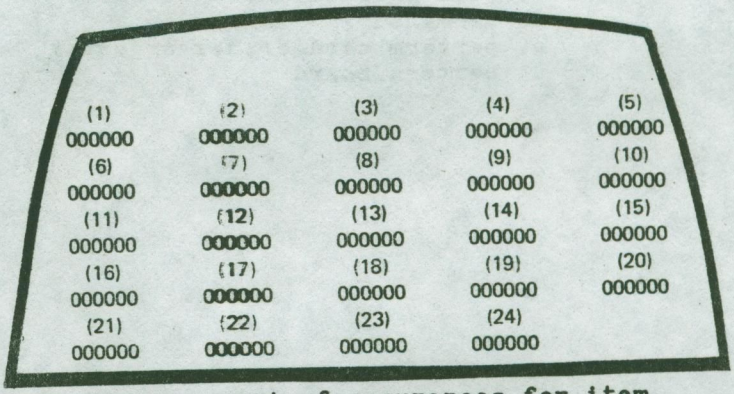
In Release VII, selecting CLEAR ERRORS causes the count on the first page to be added to the count on the second page. The count on the first page is reset to zero. Loading a Master System Save is the only means of resetting the second page of error information.

ERROR ACCUMULATORS

The following is a list which details the type of error that is counted in each of the 24 accumulators:

ERROR ACCUMULATORS
FOR SOFTWARE RELEASES VIIA AND VIIB

Format of Error Page for
Software Releases VIIA and VIIB



Displays count of occurances for item.
Refer to listing beginning on page 10-8.

SCREEN LAYOUT

MEMORY LOCATIONS

Memory locations for each item in error page will be noted with some possible indications of trouble sources in equipment or software. "X" in memory location = 5 for 24k systems, and = 7 for 32k systems.

1. The number of terminal lockouts (ERROR PASSE: that a system has encountered. "Usually indicates a software error."

* X7450

a. bad batch
b. bad format
c. will probably need to warms
d. terminal
e. perterm card, or hex or octal perterm board

2. The number of occurrences of a CORE FULL message on the system indicates that no dynamic core was available during an operation. If possible, send a system save to Burlington before doing a WARM START.

X7451

a. usually software
b. formatting problem
c. remote possibility of memory bug
d. should be using a sys-gen'd tape --could waste 8--20k

* X=5 on 24k system
X=7 on 32k system

3. The number of occurrences of the "KEYBOARD OVERFLOW" error message on the system. Possible causes: tags too long; value tables too large; too many auto-function fields. (over 256 keystrokes waiting to be handled) X7452
   a. Have operators stop keying while you watch scopes. Last scopes to stop changing are likely using problem area in relation to tags, value tables, auto function fields, etcetera.
   b. formatting problem
   c. rapidly releasing through batches
   d. remove or shorten tags to minimize display
   e. could be disk errors slowing down system

4. The number of occurrences of an unknown interrupt. Check priority jumpers, etc. X7453

5. Number of occurrences of a power failure. X7454
   a. upper supply
   b. lower supply
   c. CPU board
   d. check stability of input AC line
   e. writes core on disk as last item in power fail routine

6. The number of occurrences of a disk error with status. (recoverable)
X7455
   a. checksum error
   b. could be memory
   c. J-10, J-2, J-3 disc boards
   d. filter on disk drive
   e. try P.M.
   f. usually logs elsewhere also

7. The number of occurrences of a disk in core compare error. X7456
Read after write compare error
   a. usually J-10 disk board--run DSKDA
   b. memory plane -- often type of failure memory checker will not find -- run Rel. 5 memory tests, Rel. 4 Disk Acc. with memory option, or software exercisor.
   c. bad disk controller

8. The number of occurrences of a disk time-out without an interrupt.
X7457 (disk did a restore) No disk interupt after last disk operation -- Software then requests an illegal operation to fake interupt.
   a. disk 20 controller
   b. often CPU board
   c. J-10 or J-1 disk board
   d. bad disk block
   e. if items 8 and 10 have a ratio of 4:2 can be bad flow in editor language or similar error in software

9. The number of occurrences of a disk read error. X7460
   a. dirty heads
   b. damaged disk pack
   c. bad memory

10. The number of occurrences of a disk write error. X7461
    (check light)
    a. bad pack
    b. dirty heads
    c. disk 20 board

11. The number of disk read checksum errors. X7462
    a. damaged pack
    b. bad memory
    c. dirty heads
    d. noisy disk power supply
    e. bad J-10

12. The number of "data late" disk errors. X7463
    a. J-10
    b. memory -- often fails mem option on disk acceptance (rel. 4)

13. The number of disk read-after-write checksum errors. X7464
    a. bad pack
    b. disk 20 controller

14. The number of disk transfer length errors. X7465 (disk acc. will not always find this one)
    a. disk "J" boards
    b. disk 20 controller
    c. memory, usually addressing

15. The number of data check disk errors. X7466
    a. J--10 board
    b. J--9 board
    c. J--1 board

16. The number of attempts to reallocate a disk sector that is already allocated. Memory or software are possible causes. X7467
    a. more often memory
    b. bad flow in editor language

17. The number of "data late" errors encountered while running in communications mode. X7470
    a). poor line
    b). maybe timing

18. The number of "parity" errors encountered while running in communications mode. X7471
    a). maybe line "Hits"
    b). run bisync analyzer (sw. 0 and sw. 15) while comm running under software
    c). run COMMR
    d). replace comm controller
    e). check memory

19. The number of times that a disk WARM START has been done on the system. X7472. Should not be high; check terminal and scanner operations, and debrief operations to be sure supervisor understands use of warms. Run SYSD1 on as many scopes and peripherals as possible.

20. The number of times that a disk WARM START has been executed with resultant file degradation on the system. Recommend "COLD START" as soon as possible. X7473. Better yet, do ABL or "rescue".
    a). may be corrupted system from prior err
    b). bad batch
    c). doing a warms in middle of a save
    d). doing a warms in middle of a warms

21. The number of scanner stops. X7474. May see high counts here – may not indicate errors.
    a). can be terminal, perterm
    b). could be scanner board problem

22. The number of memory checksum failures. X7475
    a). flaky memory
    b). run addressing type memory test
    c). sometimes shows on memory option of disk acceptance of rel. 4

23. Unassigned. X7476 may be used in future to flag disk unit # for multi-disk systems.

23. (Software Release VIIB). The number of times that system exerciser has been run. Have locked customer out of exercisor in Release VIIC and later. Exercisor can only be run on a non-sys-gen'd master on 7B.

23. Number of bad sectors bypassed if CPU was set via switches to "bypass".

24. The revision level of the software load being run. X7477 * Should be the latest available.

NOTE: In the event that the terminal cannot be used, you can find these error accumulators in memory starting at location –

Release VIIA – 57450_8 (24K system)
77450_8 (32K system)

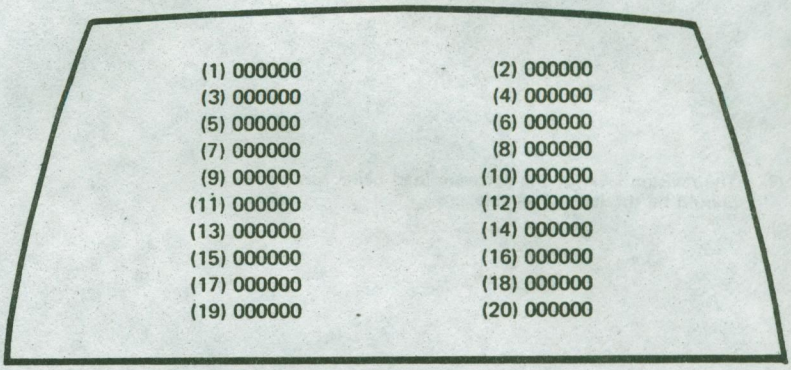
Release VIIB – 57450_8 (24K system)
77450_8 (32K system)

Each error accumulator takes one memory location (one word).

Each error accumulator takes one memory location (one word).

ERROR ACCUMULATORS
FOR SOFTWARE RELEASE VI

Format of the Error Page



SCREEN LAYOUT

NOTE: For Release VI software this list will be displayed by entering @***@ when the Supervisor HELP List is displayed.

1. "Terminal lockout." The number of times the all ?'s message has been displayed.

```
a. terminal
b. bad batch
```

2. The number of unknown interrupts. System 480 allows only disk, powerdown and clock interrupts. Any other type of interrupt indicates a hardware malfunction.

```
a. check priority jumpers
b. any controller or terminal -- go through
   them one at a time
```

3. "Keyboard overflow"; the number of times software was unable to respond to keystrokes. Three common causes are: (1) too many display requests per keystroke (e.g., rapidly releasing through a batch in Examine Mode); (2) disk errors slowing down operations; (3) value tables.

```
formatting problems most likely
shorten tags
(2) not likely, but possible
```

4. The number of times the system was powered up. (Each power up implies a power down.)

5. The number of read-after-write compare errors. (Disk) Implies defective disk controller or core memory.

   a. bad pack

6. The number of recoverable disk errors. Logging only – (P.M. ASAP)

   P.M. as soon as possible

7. The number of times the A, B, and C disk registers were set and then read with a miscompare detected. Implies a malfunctioning disk controller.

   (disk checksum)

8. The number of disk time-outs. No disk interrupt was generated after the last disk operation. System 480 software recovers by requesting an illegal disk operation to cause an interrupt, return bad status, end retry.

   a. cpu
   b. bad pack
   c. bad core

9. The number of disk read checksum errors. (Bad disk/memory.)

   a. bad pack
   b. disk 20

10. The number of disk errors. (Bad Disk)

```
a. "J" board in disk
b. disk 20
c. core
d. noisy disk power supply
```

11. The number of bit map deallocation errors. An attempt was made to deallocate an unallocated disk sector. If no disk errors occurred, it implies a memory failure.

```
memory 9 out of 10 times, even if disk
errors were logged.

Non-recoverable
System Error -- Load Warms
```

12. The number of times an illegal disk address was generated.

```
a. disk 20
b. memory

System Error -- Load Warms
```

13. The number of times a change has occurred in the constant portion of memory (checksum error). Indicates a memory problem.

```
a. memory
b. disk error

Non-recoverable
System Error -- Load Warms
```

14. The number of queue/core disk address miscompares.

```
a. dirty heads
b. bad core
```

15. The number of "fatal" write errors that have occurred. (The system attempted to write on 10 different sectors, trying to write 4 times in each sector.)

```
a. disk 20
b. "J" boards in disk
c. dirty heads
d. disk power supply
```

16. The number of times the "Scanner Stop" error has occurred.

```
a. scanner
b. cpu
c. terminal
```

17–20. Unassigned.

NOTES:

1. Errors 11, 12, 13, 15 are considered nonrecoverable and result in the message "SYSTEM ERROR – LOAD WARMS" on all terminals.

2. Errors 11, 12, 13, 15 are difficult to diagnose. However, they could imply either of the following:

   a. Memory has failed in the portion that is not checksummed.

   b. A disk error occurred.

3. Error Message Buffer. Once the error accumulators display is released by depressing REL or HELP, the error message buffer is displayed. It consists of five columns of 10 entries each. The entries are read horizontally across the screen. These entries (messages) provide additional information concerning some of the errors described above. They are logged by storing the octal equivalent of the error number (accumulator number) in one location and related information in succeeding locations.

Currently six errors result in additional information in the error message buffer.

1. Terminal Lockup (two entries)
   a. Error number – 000001
   b. Core address of the software routine flagging the error

2. Unknown Interrupt (two entries)
   a. Error number – 000002
   b. Device issuing the interrupt – the result of an INTA instruction

3. Disk In-Core Compare Error (four entries)
   a. Error number – 000005
   b. Core address of the miscompare
   c. Contents of the core location
   d. Contents of the corresponding read-after-write buffer location

4. Disk Error w/Status
   a. Error number – 000006
   b. Status of Disk

5. Checksum
   a. Error number – 000011
   b. Checksum difference

6. Disk Error
   a. Error number – 000012
   b. Error Type
      12 – Disk Read Error
      11 – Disk Write Error (attempted four times)
   c. Disk Address
   d. Core Address

SPARE PARTS LIST

SPARE PARTS CATALOGUE

NOTATION

Each major unit within the Seecheck system is assigned an assembly number, and spare parts for these units are identified by part numbers that are derivatives of the assembly number.

The index at the front of the catalogue lists all major units. Spare parts are listed in the same order.

The part number and full description should always be quoted. An additional reference is shown against each part, this is the vendor reference and should only be used in conjunction with technical manuals to identify the Redifon part number.

ITEMS MARKED * are not in current production

ITEMS MARKED (C) are termed CONSUMABLE

ITEMS MARKED (O) are not repairable

The recommended levels are based on:

Level 1	A mobile engineer covering	1- 6 sites
Level 2	Area level spares	1-25 sites
Level 3	Base support spares	1-150 sites

PART NUMBER CHANGES

Several changes of part numbers have taken place, these are listed below. Always quote the new number.

DESCRIPTION	OLD NUMBER	NEW NUMBER
J1 Disk Servo	048–114–0	043–033–001
J2 Disk Seek	048–115–0	043–033–002
J3 Disk Address	048–116–0	043–033–003
J8 Disk Logic	048–117–0	043–033–004
J9 Disk Start	048–118–0	043–033–005
J10 Disk Data	048–119–0	043–033–006
Tape PCBA E19	048–426–0	043–046–001
Tape PCBA E17	048–427–0	043–047–001
Tape PCBA C1	048–293–0	043–023–002
Tape Formatter Read 1600 BPI	048–294–0	043–023–005
Tape Formatter Write 1600 BPI	048–295–0	043–023–006
Data F 1600 BPI	048–291–0	043–023–004
Servo & PSU	048–292–0	043–023–001
Photo Tab Assy	026–010–0	043–023–018
Servo Drive Belt	126–006–0	043–023–021
Fluxgate	599–071–0	043–023–031
Extender Disk Drive	048–127–0	043–033–026
Head Adjusting Tool	457–061–0	043–033–024
Torque Wrench Set	457–060–0	043–033–023
CE Cartridge High Density	599–062–1	043–033–025
Extender Tape Drive	048–425–0	043–023–027

REVISION NUMBER:

RECOMMENDED SPARES FOR: SEECHECK MAJOR ASSEMBLIES

DATE:30/03/76 ASSY.NR:000/000/0

DESCRIPTION: /INDEX ONLY/

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	TOOLS & TEST EQIPMENT	000/000/000	N/A	0000	0000	0000
002	P.MATERIAL	000/000/000	N/A	0000	0000	0000
003	BCG 9/800	001/046/1	N/A	0000	0000	0000
004	BCG 7/556	001/046/2	N/A	0000	0000	0000
005	BCG 9/1600	001/046/3	N/A	0000	0000	0000
006	TERMINAL MK 1 K.P.	001/072/0	N/A	0000	0000	0000
007	TERMINAL MK 1 T.W.	001/072/1	N/A	0000	0000	0000
008	TERMINAL MK IT K.P.	001/096/0	N/A	0000	0000	0000
009	TERMINAL MK 11 T.W.B	001/096/1	N/A	0000	0000	0000
010	TERMINAL MK II T.W.A	001/096/2	N/A	0000	0000	0000
011	DCC MINT COMPUTER MOD.	004/054/0	D.C.C.116	0000	0000	0000
012	CABLE ASSEMBLIES	023/000/000	N/A	0000	0000	0000
013	BUCODE 9CH TAPE DRIVE	043/021/0	002	0000	0000	0000
014	BUCODE 7CH TAPE DRIVE	043/022/0	002	0000	0000	0000
015	PERTEC 9CH 1600 TAPE DRIVE	043/023/0	6640-9-25	0000	0000	0000
016	PERTEC FORMATTER	043/024/0	F649-40-25	0000	0000	0000
017	DISC DRIVE	043/033/0	30 SERIES	0000	0000	0000
018	CARD READER	043/036/0	M300L	0000	0000	0000
019	PAPER TAPE READER HSP 500	043/042/0	HSR 500P	0000	0000	0000
020	PERTEC 9CH /8000/SERIES.	043/043/0	8000 SERIE	0000	0000	0000
021	DISC UNIT FIXED	043/045/0	D1451	0000	0000	0000
022	PERTEC 9CH TAPE DRIVE	043/046/0	6840-9-25	0000	0000	0000
023	PERTEC 7CH TAPE DRIVE	043/047/0	6840-75-25	0000	0000	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
024	CENTRONICS 101A	045/015/0	101A	0000	0000	0000
025	DATA PRINTER V-132C	045/016/0	V-132C	0000	0000	0000
026	ENM PRINTER 100	045/025/0	4100	0000	0000	0000
027	ENM PRINTER 165	045/026/0	4165	0000	0000	0000
028	TELETYPE ASR 33	045/030/0	ASR 33	0000	0000	0000
029	DATA PRODUCTS PRINTER 2230	045/034/0	2230	0000	0000	0000
030	LINE PRINTER 2260	045/036/0	LP 2260	0000	0000	0000
031	CENTRONICS 101AL	045/037/0	101AL	0000	0000	0000
032	DOUBLE RAY SPARES	048/015/0	ORSFLFTE	0000	0000	0000
033	SEECHECK DESK	096/039/2	N/A	0000	0000	0000

REVISION NUMBER:

DATE: 30/03/76 ASSY.NR: 000/000/0

RECOMMENDED SPARES FOR: SEECHECK OPTIONS

DESCRIPTIONS: /INDEX ONLY/

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	DUPLEX R.C.G.	001/051/0	N/A	0000	0000	0000
002	SERIAL PRINTER /101A/	001/070/0	N/A	0000	0000	0000
003	SERIAL PRINTER ENM 4100	001/070/1	N/A	0000	0000	0000
004	SERIAL PRINTER ENM 4165	001/070/2	N/A	0000	0000	0000
005	ENTREX R.T.A.'S MODIFIED FOR	001/094/3	N/A	0000	0000	0000
006	2ND DISK DRIVE /ENTREX B.C.G./	098/061/1	N/A	0000	0000	0000
007	9 CH B.C.G.WITH 7CH ADD-ON	098/063/0	N/A	0000	0000	0000
008	7 CH B.C.G.WITH 9CH ADD-ON	098/063/1	N/A	0000	0000	0000
009	1600 B.P.I.ADD-ON	098/063/2	N/A	0000	0000	0000
010	DUPLEX SERIAL PRINTER-2B.C,G.	098/064/0	N/A	0000	0000	0000
011	DUPLEX LINE PRINTER-2 B.C.G.	098/065/0	N/A	0000	0000	0000
012	DUPLEX LINE PRINTER-2 B.C.G.	098/065/1	N/A	0000	0000	0000
013	RACK WITH DISK AND 1600 TAPE	098/070/0	N/A	0000	0000	0000
014	RACK WITH DISK AND 9CH TAPE	098/070/1	N/A	0000	0000	0000
015	RACK WITH DISK AND 7CH	098/070/2	N/A	0000	0000	0000
016	MULTIPLE DISK RACK /2DISKS/	098/071/0	N/A	0000	0000	0000
017	MULTIPLE DISK RACK /3DISKS/	098/071/1	N/A	0000	0000	0000
018	1B.C.G.& 2SERIAL PRINTERS	098/072/0	N/A	0000	0000	0000
019	1B.C.G.& 2 SERIAL PRINTERS	098/072/1	N/A	0000	0000	0000
020	1B.C.G.& 2 SERIAL PRINTERS	098/072/2	N/A	0000	0000	0000
021	LINE PRINTER V-132 C	098/073/0	N/A	0000	0000	0000
022	PRINTER DATA PRODUCTS	098/073/1	N/A	0000	0000	0000
023	COMMS CONTROL IBM	098/076/0	N/A	0000	0000	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
024	COMMS CONTROL ICL	098/077/0	N/A	0000	0000	0000
025	PAPER TAPE READER	098/078/0	N/A	0000	0000	0000
026	CARD READER	098/079/0	N/A	0000	0000	0000
027	ERROR LIGHT TERMINAL MOUNTING	098/080/1	N/A	0000	0000	0000
028	ERROR LIGHT FREE STANDING	098/081/0	N/A	0000	0000	0000

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARES CATALOGUE UK

DATE: 30/[illegible]/76 ASSY. NR 000/000/0

DESCRIPTION: TEST EQIPMENT

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	DIGITAL MULTIMETER	015/005/0		0000	0001	0002
002	SCOPE TEX 463	040/013/0	463	0000	0001	0000
003	SCOPE COSSER CU 150	040/016/0	OBSOLETE	0001	0000	0002
004	SCOPE COSSER 4100	040/017/0	4100	0001	0000	0001
005	SCOPE TTY D 61	040/018/0	D61	0001	0000	0002
006	PRORES 6FT /0/	040/019/0	010027002	0002	0002	0010
007	TOOL CASE TC 200 TOOLS/0/	457/062/0	TC200	0001	0000	0001
008	SOLDERING IROM /0/	457/063/0	W60D	0001	0000	0002
009	MASTER ALTGNMENT TAPE /0/	457/066/0	N/A	0001	0000	0002
010	SOLDERPUL /0/	457/067/0	SS011	0001	0000	0004
011	DENTLE MIRROR /0/	457/080/0	1187/4	0001	0000	0002
012	HAND WRAP TOOL /0/	457/086/0	HW30	0000	0001	0002
013	HAND UNWRAP TOOL /0/	457/087/0	505084	0000	0001	0002
014	IC TEST CLIP 14 PIN /0/	457/088/0	23588	0001	0000	0002
015	IC TEST CLIP 16 PIN /0/	457/097/0	236588	0001	0000	0002
016	CRIMP TOOL AMP 90202 /0/	457/099/0	90202/2	0000	0000	0003
017	TOOL CASE TC 100 @ TOOLS /0/	457/100/0	TC100	0000	0001	0001
018	AVO MULTIMETER MOD 8	590/035/0	MODEL 8 MK	0001	0000	0002
019	DEPFNDATHERM & PROBF	599/068/0	MPC3	0000	0001	0002
020	CURRENT PROBE	599/080/0		0000	0001	0001

REVISION NUMBER:

DATE: 30/03/76 ASSY. NR: 000/000/0

RECOMMENDED SPARES FOR: SPARES CATALOGUE UK

DESCRIPTION P.M MATERIAL

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	HUGGER ADJUST CLIPS /C/	174/067/0	TC53544	0000	0000	0100
002	KIMWIPES CARTON /C/	457/040/0	24 RXS PE6	0000	0001	0002
003	COTTON RUDS 100 PKT /C/	457/041/0	N/A	0001	0001	0050
004	GAUSE SWARS /C/	457/059/0	2235001	0001	0001	0010
005	SOLDER SUCKER WICK /C/	457/064/0	N/A	0001	0010	0010
006	ROLL 60/40 22SWG SOLDER /C/	457/065/0	1/2 KTLO	0001	0001	0010
007	BOTTLE T.P.A./C/	457/101/0	N/A	0001	0001	0010
008	SPRINT CLEANER /C/	457/102/0	N/A	0001	0001	0010
009	EOR/BOT MARKERS /C/	670/021/0	BOX	0001	0000	0002
010	MYLAR FORMAT TAPE 100FT /C/	670/023/0	N/A	0000	0000	0001

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE: 30/03/76 ASSY.NR: 001/046/0

DESCRIPTION: BASIC CONTROL GROUP FOR 9/800 9/1600 7/556

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	R.T.A. REMOTE	001/094/1	0203008800	0000	0000	0001
002	R.T.A. CENTRAL	001/094/2	0203008890	0000	0000	0001
003	LEVEL CONVERTER	006/038/0	1112-7	0000	0001	0001
004	DISC PSU DYNAGE	010/076/0	4099006320	0000	0000	0000
005	DISC PSU 029	010/107/0	029	0000	0001	0004
006	P.S.U. UPPER	010/108/0	80016 G1	0000	0001	0004
007	P.S.U. LOWER	010/109/0	80016 G2	0000	0001	0004
008	* PERTEC DISK PSU	010/118/0	S1416-240	0000	0001	0002
009	TAPE CONTROLLER 9CH	048/108/0	N/A	1 3	0001	0002
010	TAPE CONTROLLER 9CH TESLA	048/108/2	N/A	0000	0000	0000
011	TAPE CONTROLLER 7CH	048/109/0	N/A	1 3	0001	0002
012	SCANNER	048/120/0	N/A	0001	0000	0004
013	TELETYPE CONTROLLER	048/121/0	6245002340	0000	0000	0000
014	EXTENDER P.C.P. /0/	048/128/0	6245001260	0000	0001	0001
015	PER TERM CARD A	048/129/1	N/A	0001	0000	0006
016	PER TERM CARD R	048/129/2	N/A	0000	0001	0004
017	PER TERM CARD C	048/129/3	N/A	0001	0000	0010
018	CPU NOVA 1200 MOD	048/159/0	OBSOLETE	0000	0000	0000
019	MEMORY RK	048/160/0	N/A	0002	0002	0010
020	DISK CONTROLLER	048/181/0	N/A	0001	0000	0005
021	UPPER FRONT PANEL	048/182/0	N/A	0000	0001	0002
022	TAPE CONTROLLER 1600	048/185/0	N/A	1 3	0001	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	PRINTER CONTROLLER	048/190/0	N/A	0000	0001	0003
024	DUPLEXOR P.C.B.	048/290/0	N/A	0000	0001	0002
025	CPU DCC 116 MOD	048/319/0	400305	0001	0000	0006
026	R.T.A. LOGIC PCB	048/340/0	6245001850	0000	0000	0001
027	LOWER FRONT PANEL	048/346/0	400585	0000	0001	0001
028	PSU MOTHER PCB UPPER	048/348/0	400330	0000	0001	0001
029	PSU MOTHER PCB LOWER	048/348/1	400330	0000	0001	0001
030	COMMS CONTROLLER TCL	048/392/0	4015	0000	0001	0002
031	R.T.A. MODEM P.C.B.	048/399/0	6245001850	0000	0001	0001
032	PERT 2 LINE ORIVER	048/400/0	N/A	0000	0000	0000
033	COMMS CONTROLLER IBM	048/415/0	415	0000	0001	0002
034	TERMINAL LINE DRIVER	048/417/0	N/A	0000	0000	0000
035	CARD READER CONTROLLER	048/429/0	01706	0000	0000	0001
036	* 9 CH UNIT 19	048/437/1	N/A	1 3	0001	0002
037	MEMORY 16K	048/438/0	116875	0001	0001	0005
038	MEMORY 16K	048/441/0	APM 1200	0000	0000	0000
039	MEMORY 16K	048/442/0	262	0000	0000	0000
040	* HEX TERM PCB	048/449/0	N/A	0001	0001	0005
041	* TCU 17 PCB	048/450/0	N/A	1 3	0001	0002
042	MOD KTT FOR ABOVE /0/	052/204/0	N/A	0000	0000	0000
043	PER TERM CAGE	091/035/0	N/A	0000	0000	0001
044	B.C.G. REAR FAN /C/	242/023/0	7550	0000	0001	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
045	FAN 115V /C/	242/024/0	4500	0000	0001	0002
046	AIR FILTER /C/	254/039/0	TO DWG	0000	0000	0000
047	SHIELD P.C.B. /0/	306/068/0	N/A	0000	0000	0005
048	RUNNER ASSY /C/	413/028/0	IMS 801/21	0000	0000	0002
049	FRONT DOOR SPRING /C/	434/034/0	4340340	0000	0002	0010
050	CIRCUIT BREAKER /C/	534/023/0	190-220-10	0000	0001	0002
051	FILTER FLECTRICAL ASSY /0/	538/018/0	0229	0000	0000	0002
052	FUSE 10A TAPE MINT /C/	570/001/0	N/A	0005	0000	0025
053	FUSE 12A MINI /C/	570/001/1	N/A	0005	0000	0025
054	FUSE 1AMP TERM II /C/	570/005/0	N/A	0005	0000	0025
055	FUSE 3AMP SB TAPE /C/	570/009/0	N/A	0005	0000	0025
056	FUSE 10AMP SB MINI /C/	570/013/0	N/A	0005	0000	0025
057	FUSE 15A S/B DISK /C/	570/014/0	N/A	0005	0000	0025
058	FUSE 5A S/B MINI/DISK /C/	570/014/4	N/A	0005	0000	0025
059	FUSE 7A S/B MINI /C/	570/024/1	N/A	0005	0000	0025
060	FUSE 2A MINI /C/	570/029/3	N/A	0005	0000	0025
061	FUSE 4A TERM II /C/	570/055/0	N/A	0005	0000	0025
062	LAMP /C/	578/065/0	008000	0005	0005	0100
063	ELAPSF TIME METER	590/033/1	560-3	0000	0000	0002
064	DISK PACK	599/044/0	4415	0001	0001	0015
065	DUPLEX SWITCH /C/	654/019/0	93A/4208/1	0000	0000	0002
066	ON/OFF SWITCH /C/	656/089/0	RN021P	0000	0001	0004

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
067	SWITCH LOCK ASSY /C/	658/049/0	800067	0000	0001	0005
068	MICRO SWITCH REAR DOOR /C/	662/032/0	12TL6/3	0000	0000	0002
069	SWITCH DPDT MOMENT /C/	664/063/0	008217	0000	0001	0002
070	SWITCH SPDT /C/	6 64/071/0	008215	0000	0001	0002
071	SWITCH SPDT MOMENT /C/	664/072/0	008216	0000	0001	0002

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE 30/03/76 ASSY. NR 001/072/0

DESCRIPTION: MK 1 SEECHECK TERMINAL ALL TYPES

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	SHARPS T.V	001/073/0	OBSOLETE	0000	0000	0000
002	POWER SUPPLY	010/101/0	N/A	0001	0000	0010
003	INTER CONNECTION CABLE /C/	023/092/0	N/A	0000	0002	0004
004	MOTOROLA	040/008/0	5799016200	0000	0001	0004
005	LOGIC I/II	048/296/0	N/A	0003	0000	0015
006	AUDIO AMP PCB	048/298/0	N/A	0000	0000	0002
007	TERMINAL FAN /C/	242/014/0	4550	0002	0000	0010
008	CAPACITOR 33 U /C/	516/129/0	N/A	0000	0000	0010
009	CAPACITOR 470 U /C/	516/222/0	N/A	0000	0000	0010
010	CAPACITOR 3300 U /C/	516/223/0	N/A	0000	0000	0010
011	CAPACITOR 3300 U /C/	516/223/0	N/A	0000	0000	0010
012	CAPACITOR 6000 U /C/	516/224/1	N/A	0000	0000	0010
013	MOTOROLA TUBE ONLY /C/	562/007/0	9VADP4	0000	0000	0005
014	SPEAKER /C/	582/010/0	TW65G	0000	0000	0005
015	100 K POT /C/	642/121/0	N/A	0000	0000	0010
016	KEY SWITCH UK /GREY/ /C/	656/093/0	SF.5101	0005	0000	0100
017	KEY SWITCH USA /BLACK/ /C/	656/094/0	SB.2010	0005	0000	0100
018	TRANSISTOR AUDIO AMP /C/	686/148/0	N/A	0005	0000	0050
019	TRANSISTOR AUDIO AMP /C/	686/152/0	N/A	0005	0000	0050

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE: 30/03/76 ASSY. NR 101/096/0

DESCRIPTION: MK II SEECHECK TERMINAL ALL TYPES

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	KEYBOARD ASSY. TW /A/	009/011/1	N/A	0000	0001	0002
002	KEYBOARD ASSY. TW /B/	009/011/2	N/A	0000	0000	0002
003	MK II PSU	010/111/0	40.18.9002	0001	0000	0010
004	MK II INTERCONNECTION CABLE /C/	023/092/0	N/A	0000	0000	0006
005	MK II INTERCONNECTION ASSY. /C/	023/178/0	N/A	0000	0000	0006
006	MK II MONITOR	040/012/0	XN226.66	0000	0001	0003
007	K/B ASSLY 029	048/021/3	945547	0000	0001	0002
008	TERMINAL PCB NO 4	048/396/0	N/A	0002	0000	0010
009	K/B ADAPTOR /0/	048/402/1	N/A	0000	0002	0002
010	LINE FILTER /C/	538/021/0	6EF2 6A	0000	0000	0006
011	MK II SPEAKER /C/	582/011/0	736057	0000	0000	0005
012	SWITCH SLIDE /C/	642/135/0	S6767	0000	0000	0006
013	SWITCH ROCKER /C/	654/021/0	T1GK61.1L.	0000	0000	0006
014	KEYSWITCH UK /GREY/ /C/	656/093/0	SF 5101	0000	0000	0000
015	SWITCH INTERLOCK /C/	656/095/0	E79.30A	0000	0000	0006
016	SPACE BAR MECHANISM /C/	656/108/0	KPP 002	0000	0000	0025

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE: 30/03/76 ASSY. NR: 023/000/0

DESCRIPTION: SEECHECK CABLE ASSEMBLIES

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	A.C. POWER IN ASSY /C/	023/056/0	N/A	0000	0000	0002
002	DISC DRIVE D.C.POWER CABLE /C/	023/083/0	N/A	0000	0000	0002
003	SCANNER TO PER TERM CAGE /C/	023/084/0	N/A	0000	0000	0002
004	PER TERM POWER CABLE /C/	023/085/0	N/A	0000	0000	0002
005	DISC CONT - DISC DRIVE	023/086/0	N/A	0000	0000	0002
006	1600 TAPE CONT.- FORMATTER	023/094/0	N/A	0000	0000	0002
007	FORMATTER/DRIVE	023/095/0	N/A	0000	0000	0002
008	JUMPER ASSY /C/	023/106/0	N/A	0000	0000	0002
009	JUMPER ASSY /C/	023/112/0	N/A	0000	0000	0002
010	JUMPER ASSY /C/	023/113/0	N/A	0000	0000	0002
011	PER TERM CABLE	023/132/0	N/A	0000	0000	0000
012	SERIAL PRINTER INTERFACE	023/143/0	N/A	0000	0000	0002
013	DUPLEX POWER INTERFACE /C/	023/145/0	N/A	0000	0000	0002
014	9CH TAPE CONT.- DRIVE	023/146/0	N/A	0000	0000	0002
015	7CH TAPE CONT.- DRIVE	023/146/1	N/A	0000	0000	0002
016	DUPLEX CABLE FORM /C/	023/149/0	N/A	0000	0000	0001
017	DISC - DISC CABLE	023/158/0	N/A	0000	0000	0002
018	COMMS/CPU BACK PLANE /C/	023/168/0	N/A	0000	0000	0002
019	CPU - LEVEL CONVERTER /C/	023/181/0	N/A	0000	0000	0002
020	LINE PRINTER CONT.	023/192/0	N/A	0000	0000	0002
021	BLOWER TIME METER /C/	023/203/0	N/A	0000	0000	0001
022	* CPU TO TAPE UNIT	023/226/0	N/A	0000	0000	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	* CPU TO FORMATTER	023/227/0	N/A	0000	0000	0002
024	* PERTEC DISC CONT CABLE	023/229/0	N/A	0000.	0000	0002
025	* CABLE PRINTER ASSLEY	023/231/0	N/A	0000	0000	0002
026	* CABLE TERMINAL ASSLY	023/232/0	N/A	0000	0000	0002.

REVISION NUMBER:

DATE: 30/03/76

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DESCRIPTION: 9 CH BUCODE TAPE DRIVE

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	CAPSTAN AMP	043/021/001	500022	0000	0001	0000
002	REGULATOR	043/021/002	500018	0000	0001	0003
003	REEL SERVO	043/021/003	500204	0001	0001	0004
004	RAMP GEN	043/021/004	501840	0000	0001	0004
005	WRITE AMP /4/	043/021/005	500012	0000	0002	0003
006	READ AMP /3/	043/021/006	500465	0000	0002	0003
007	WRITE CONTROL	043/021/007	500049	0000	0001	0003
008	READ STROBE	043/021/008	500573	0000	0001	0003
009	TRANSPORT CONTROL	043/021/009	501837	0000	0001	0003
010	AMP/I/F	043/021/010	500653	0000	0001	0003
011	TERMINATOR /0/	043/021/011	500559	0000	0001	0003
012	TRANSPORT I/F	043/021/012	500650	0000	0001	0003
013	READ HEAD CARD	043/021/013	500468	0000	0001	0004
014	READ AMP /1/	043/021/014	500465	0000	0001	0003
015	WRITE AMP /1/	043/021/015	500012	0000	0001	0003
016	MAG HEAD 9 CH /0/	043/021/016	A.100001	0000	0001	0004
017	CAPSTAN	043/021/017	B.500188	0000	0001	0003
018	TAPE CLEANER /C/	043/021/018	P.500472	0000	0000	0003
019	FERRITE PAD /C/	043/021/019	P.500469	0000	0000	0003
020	REEL MOTOR	043/021/020	P.500582.0	0000	0001	0003
021	REEL MOTOR	043/021/021	P.500582.0	0000	0001	0003
022	CAPSTAN MOTOR	043/021/022	P.500589	0000	0001	0003

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	FILE PROTECT RELAY /C/	043/021/023	P.500547	0000	0001	0004
024	TAPE GUTDF ROLLER /C/	043/021/024	S.053.003	0000	0000	0003
025	POT 5K OHM /C/	043/021/025	S.526.011	0000	0000	0003
026	TAPE GUIDE ROLLER /C/	043/021/026	S.053.001	0000	0000	0003
027	SWITCH PUSHRUTTON /C/	043/021/027	S.531.025	0000	0000	0003
028	SWITCH MOMENTARY /C/	043/021/028	S.531.008	0000	0000	0003
029	LAMP FLANGE /C/	043/021/029	S.532.003	0000	0000	0003
030	LAMP RA- 8HOLDER /C/	043/021/030	S.532.004	0000	0000	0003
031	RELAY 12V D.C. /C/	043/021/031	S.534.002	0000	0000	0003
032	FUSE 15A SLO BLO /C/	043/021/032	570.013.0	0000	0000	0000
033	FUSE 5A /C/	043/021/033	570.014.4	0000	0000	0000
034	SWITCH DPST /C/	043/021/034	S.531.022	0000	0000	0003
035	FAN ASSY 115V /C/	043/021/035	242.024.0	0000	0000	0003
036	TRANSFORMER /0/	043/021/036	S.541.001	0000	0001	0003
037	RING HUR /0/	043/021/037	B.500.066	0000	0000	0003
038	SWITCH MOMENTARY /C/	043/021/038	S.431.007	0000	0000	0003
039	SPRING - FLEX /C/	043/021/039	S.020.002	0000	0000	0003
040	PIN FILE PROTECT /C/	043/021/040	A.500622.0	0000	0000	0003
041	LATCH ASSY PAWL /C/	043/021/041	S.021.001	0000	0000	0003
042	POWER SUPPLY ASSY.	043/021/042	P.500097	0000	0001	0002
043	EOT/BOT SENSOR /C/	043/021/043	P.501478	0000	0001	0003
044	MICRO SWITCH ASSY. /C/	043/021/044	S.531-7	0000	0000	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
045	TAPE GUIDE ASSY. /C/	043/021/045	P.500471	0000	0000	0002
046	WRITE AMP /3/	043/021/046	500968	0000	0000	0000

REVISION NUMBER:
RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE: 30/03/76 ASSY.NR:045/022/0
DESCRIPTION: 7 CH BUCODE TAPE DRIVE

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	MAG HEAD 7 CH /0/	043/022/001	A.100000	0000	0001	0004

REVISION NUMBER:

DATE: 30/03/76 ASSY. NR: 043/023/0

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DESCRIPTIONS: PERTEC 1600 TAPE DRIVE /6000 SERIES/

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	SERVO PSU	043/023/001	101021.01	0001	0001	0004
002	TAPE CONTROLLER C1	043/023/002	101241.01	0001	0001	0003
003	EOT BOT AMP	043/023/003	101949.01	0000	0001	0002
004	DATA F	043/023/004	101346.02	0000	0001	0002
005	READ FORMATTER	043/023/005	101381.01	0000	0001	0002
006	WRITE FORMATTER	043/023/006	101386.01	0000	0001	0002
007	FIXED OSCILLATOR	043/023/007	102096.05	0000	0001	0005
008	TRACKING OSCILLATOR	043/023/008	102094.02	0000	0001	0005
009	FUSE 3AG 10 AMP FB 1 /C/	043/023/009	570.001.0	0000	0000	0000
010	FUSE 3AG 5AMP SB /0/	043/023/010	570.014.4	0000	0000	0000
011	SWITCH "POWER" /C/	043/023/011	505.1801	0000	0001	0002
012	SWITCH "LOAD" /C/	043/023/012	505.1803	0000	0001	0002
013	SWITCH "ON LINE"/C/	043/023/013	505.1804	0000	0001	0002
014	SWITCH "REWIND" /C/	043/023/014	505.1805	0000	0001	0002
015	SWITCH "WRT EN" /C/	043/023/015	505.1806	0000	0001	0002
016	SWITCH "FORWARD" /C/	043/023/016	505.1808	0000	0001	0002
017	SWITCH "REVERSE" /C/	043/023/017	505.1809	0000	0001	0002
018	PHOTO TAB SENSOR /C/	043/023/018	100807.01	0000	0001	0002
019	SENSOR ARM ASSY /0/	043/023/019	100858.02	0000	0001	0002
020	WRITE LOCKOUT ASSY /C/	043/023/020	101003.01	0000	0001	0002
021	SERVO DRIVE BELT /C/	043/023/021	610.0007	0000	0001	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
022	MICRO SWITCH CHERRY /C/	043/023/022	506.6360	0000	0001	0002
023	RELAY 4PDT 12V /C/	043/023/023	502.1242	0000	0001	0002
024	FUSE 3AG 3AMP SR /O/	043/023/024	570.009.0	0000	0000	0000
025	FUSE HOLDER /C/	043/023/025	658.9160	0000	0000	0000
026	SHIM HEAD GUIDE /C/	043/023/026	100298.01	0000	0001	0005
027	EXTENDER PCB /O/	043/023/027	101206.01	0000	0001	0001
028	SPRING TENSION ARM /C/	043/023/028	100995.01	0000	0000	0002
029	GUIDE FIXED ASSY /C/	043/023/029	101026.01	0000	0000	0002
030	GUIDE ROLLER ASSY /C/	043/023/030	100808.01	0000	0000	0002
031	FLUX GATE /C/	043/023/031	010071-01	0000	0001	0005
032	HEAD 9 trk 1600 /O/	043/023/032	510.6169	0000	0001	0002
033	MOTOR REEL D.C.	043/023/033	500.0676	0000	0001	0002
034	CAPSTAN DRIVE ASSY	043/023/034	500.0403	0000	0001	0002
035	HEAD GUIDE /C/	043/023/035	100113.01	0000	0000	0002
036	RING GUIDE /C/	043/023/036	100115.01	0000	0000	0002
037	CAP GUIDE /C/	043/023/037	100729.01	0000	0000	0002
038	CAP GUIDE /C/	043/023/038	100114.01	0000	0000	0002
039	SPRING GUIDE /C/	043/023/039	100116.01	0000	0000	0002
040	RING GRIP /C/	043/023/040	100117.01	0000	0000	0002
041	CUSHION RUBBER /C/	043/023/041	660.0001	0000	0000	0002
042	TAPE CLEANER BLADE /C/	043/023/042	100761.01	0000	0000	0002
043	TRANSFORMER POWER /O/	043/023/043	511.6000	0000	0001	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
044	CAPACTTOR 18000MF /C/	043/023/044	134.1892	0000	0001	0002
045	CAPACTTOR 8000MF /C/	043/023/045	134.0440	0000	0001	0002
046	BRIDGE RECTIFIER /C/	043/023/046	320.9622	0000	0001	0002
047	SWITCH 1600 BPI /C/	043/023/047	505.5827	0000	0001	0002

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE: 30/03/76 ASSY. NR: 043/033/0

DESCRIPTION: DISK DRIVE 30 SERIES

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	J.1 SERVO P.C.B.	043/033/001	11078	0000	0001	0003
002	J.2 SEEK P.C.B.	043/033/002	11111.02	0000	0001	0003
003	J.3 ADDRESS P.C.B.	043/033/003	11026.01	0000	0001	0003
004	J.8 LOGIC P.C.B.	043/033/004	11085.01	0000	0001	0003
005	J.9 START P.C.B.	043/033/005	11071.00	0000	0001	0003
006	J.10 DATA P.C.B.	043/033/006	11082.15	0000	0001	0003
007	HEAT SINK ASSY.	043/033/007	11050 + S/	0000	0000	0001
008	AIR FILTER /C/	043/033/008	15170	0004	0000	0050
009	PREVENTATIVE MAINTENANCE KIT /C/	043/033/009	99000	0000	0000	0000
010	LAMP /C/	043/033/010	10545.00	0000	0000	0050
011	P.C.B. GAUZE SWABS	043/033/011	22335001	0000	0000	0000
012	AEROSOL SPRAY	043/033/012	08350040	0000	0000	0000
013	POWER DRIVER ASSY.	043/033/013	11029	0000	0000	0000
014	SERVO DRIVER ASSY.	043/033/014	11033	0000	0000	0000
015	FILTER ELECT ASSY. /O/	043/033/015	11048	0000	0000	0000
016	TRANSFORMER ASSY. /O/	043/033/016	15353	0000	0000	0000
017	HEAD CARLE ASSY. /O/	043/033/017	11114	0000	0000	0000
018	SECTOR TRANSDUCER /O/	043/033/018	15415	0000	0000	0000
019	HEAD ASSY. DOWN H.D. /O/	043/033/019	25065	0000	0000	0000
020	HEAD ASSY. UP H.D./O/	043/033/020	25066	0000	0000	0000
021	CARR. ALIGNMENT CONF /O/	043/033/021	15171	0000	0000	0001
022	CARR. ALIGNMENT PAR /O/	043/033/022	15172	0000	0000	0001

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV. 2	LEV 3
023	TORQUE WRENCH SET /O/	043/033/023	99001	0000	0000	0001
024	HEAD ADJUSTING TOOL /O/	043/033/024	T.D.10289	0000	0000	0001
025	C.E. CARTRIDGE H.D./O/	043/033/025	T.D.276	0000	0000	0001
026	EXTENDER PCB /O/	043/033/026	11040.01	0000	0000	0001
027	TERMINATOR /O/	043/033/027	11174-01	0000	0000	0001

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE

DATE: 30/03/76 ASSY. NR: 043/036/0

DESCRPTION: 300 CPM CARD READER

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE

DATE: 30/03/76 ASSY.NR: 043/042/0

DESCRIPTION: HSR 500 PAPER TAPE READER

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	FUSE 3 AMP /C/	043/042/001	570/012/3	0000	0005	0000
002	FUSE 5 AMP /C/	043/042/002	570/014/0	0000	0005	0000
003	MOTOR	043/042/003	EMK40-30/2	0000	0001	0000
004	LAMP /C/	043/042/004	382	0000	0002	0000
005	MOTHER ROARD	043/042/005	4771	0000	0001	0000
006	CONTROL BOARD	043/042/006	4470	0000	0002	0000
007	INTEGRAL PSU	043/042/007	4589	0000	0001	0000
008	REGULATOR BOARD	043/042/008	4447	0000	0002	0000
009	P.C.B. ASSY	043/042/009	7108	0000	0000	0000
010	SOLENOID ASSY LEFT /O/	043/042/010	7108	0000	0001	0000
011	SOLENOID ASSY RIGHT /O/	043/042/011	7423	0000	0001	0000
012	BRAKE COIL ASSY /O/	043/042/012	2638	0000	0001	0000
013	TAPE DRIVE ROLLER ASSY	043/042/013	4422	0000	0001	0000
014	FAN BEARING ASSY /O/	043/042/014	2781	0000	0001	0000
015	FAN /O/	043/042/015	2781	0000	0001	0000
016	FAN SPINDLE /O/	043/042/016	2641	0000	0001	0000
017	READ HEAD ASSY	043/042/017	5832	0000	0001	0000
018	JOCKEY PULLEY /C/	043/042/018	4420	0000	0002	0000
019	PULLEY PLATE ASSY	043/042/019	4418	0000	0001	0000
020	SPINDLE /FOR LOWER ADJUSTABLE/	043/042/020	4235	0000	0001	0000
021	SPRING DETENT ROLLER ASSEMBLY	043/042/021	2796	0000	0001	0000
022	BACKING SPRING /C/	043/042/022	2629	0000	0001	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	DRIVE BELT /C/	043/042/023	200.259.99	0000	0002	0000
024	BELT TENSION SPRING /C/	043/042/024	709074	0000	0002	0000
025	PLASTIC CLIP /C/	043/042/025	4788	0000	0002	0000
026	RESISTOR 10 OHM /C/	043/042/026	W21	0000	0000	0000
027	RESISTOR 220 OHM /C/	043/042/027	TR6	0000	0002	0000
028	RESISTOR 220 OHM /C/	043/042/028	TR5	0000	0000	0000
029	RESISTOR 470 OHM /C/	043/042/029	TR5	0000	0000	0000
030	RESISTOR 560 OHM /C/	043/042/030	TR5	0000	0000	0000
031	RESISTOR 1K /C/	043/042/031	TR5	0000	0002	0000
032	RESISTOR 1.2K /C/	043/042/032	TR5	0000	0002	0000
033	RESISTOR 1.5K /C/	043/042/033	TR5	0000	0002	0000
034	RESISTOR 1.8K /C/	043/042/034	TR5	0000	0002	0000
035	RESISTOR 2.2K /C/	043/042/035	TR5	0000	0002	0000
036	RESISTOR 2.7K /C/	043/042/036	TR5	0000	0002	0000
037	RESISTOR 3.3K /C/	043/042/037	TR5	0000	0000	0000
038	CAPACITOR 0.47UF /C/	043/042/038	N/A	0000	0005	0000
039	CAPACITOR 1.5UF /C/	043/042/039	N/A	0000	0002	0000
040	CAPACITOR 100UF /C/	043/042/040	N/A	0000	0002	0000
041	CAPACITOR 500UF /C/	043/042/041	N/A	0000	0002	0000
042	CAPACITOR 1000UF /C/	043/042/042	N/A	0000	0000	0000
043	CAPACITOR 5000UF /C/	043/042/043	N/A	0000	0001	0000
044	CAPACITOR 10000UF /C/	043/042/044	N/A	0000	0001	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
045	CAPACITOR 1000UF /C/	043/042/045	N/A	0000	0000	0000
046	VARIABLE RESISTOR 68K /C/	043/042/046	N/A	0000	0001	0000
047	VARIABLE RESISTOR 100K /C/	043/042/047	N/A	0000	0002	0000
048	DIODE IN4148 /C/	043/042/048	N/A	0000	0010	0000
049	DIODE BYX36-150 /C/	043/042/049	N/A	0000	0002	0000
050	RECTIFIER ZS 274 /C/	043/042/050	N/A	0000	0002	0000
051	ZENER DIODE IN5353 /C/	043/042/051	N/A	0000	0002	0000
052	ZENER DIODE BZY88 C6V2 /C/	043/042/052	N/A	0000	0002	0000
053	ZENER DIODE BZY88 C3V3 /C/	043/042/053	N/A	0000	0002	0000
054	TRANSISTOR BC 113 /C/	043/042/054	N/A	0000	0010	0000
055	TRANSISTOR U19387/2 /C/	043/042/055	N/A	0000	0005	0000
056	TRANSISTOR U19353/1/C/	043/042/056	N/A	0000	0005	0000
057	TRANSISTOR 2N2906 /C/	043/042/057	N/A	0000	0005	0000
058	TRANSISTOR 2N5191 /C/	043/042/058	N/A	0000	0005	0000
059	TRANSISTOR 2N4918 /C/	043/042/059	N/A	0000	0002	0000
060	TRANSISTOR MJF3055 /C/	043/042/060	N/A	0000	0002	0000
061	TRANSISTOR 2N3055 /C/	043/042/061	N/A	0000	0002	0000
062	TRANSISTOR LM 309 K /C/	043/042/062	N/A	0000	0000	0000
063	INTEGRATED CIRCUIT /C/	043/042/063	936	0000	0006	0000
064	INTEGRATED CIRCUIT /C/	043/042/064	946	0000	0006	0000
065	MICROSWITCH /C/	043/042/065	V4	0000	0002	0000
066	PLUG	043/042/066	460-3308-1	0000	0010	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV3
067	SOCKET /C/	043/042/067	450-3704-1	0000	0010	0000
068	TR.MOUNTING PADS	043/042/068	H181	0000	0020	0000
069	RECTIFIER BRIDGE +5V +3V /C/	043/042/069	WP005	0000	0002	0000
070	RECTIFIER BRIDGE +9V /C/	043/042/070	MDA980-1	0000	0001	0000
071	FUSE HOLDER /C/	043//42/071	F296	0000	0002	0000
072	FUSE HOLDER /C/	043/042/072	L1426	0000	0000	0000
073	FUSE 1A /C/	043/042/073	570/005/0	0000	0005	0000
074	FUSE 1A /C/	043/042/074	570/016/0	0000	0005	0000
075	FUSE 3A /C/	043/042/075	570/ 009/0	0000	0005	0000
076	FUSE 5A /C/	043/042/076	570/006/0	0000	0005	0000
077	FUSE 2A /C/	043/042/077	570/029/3	0000	0005	0000
078	TREND READER TEST SFT	043/042/078	HR01	0000	0000	0000
079	LAMP ALIGNMENT CHART /C/	043/042/079	HR02	0000	0000	0000
080	SETTING-UP FILTER	043/042/080	HR03	0000	0000	0000
081	SOLENOID ADJUSTING TOOL /O/	043/042/081	HR04	0000	0000	0000

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE: 30/03/76 ASSY. NR: 043/043/0

DESCRIPTION: 9 CH PERTEC TAPE DRIVE /8000 SERIES/

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	PCBA, CONTROL "J"	043/043/001	102334-17	0000	0001	0001
002	CAPSTAN MOTOR	043/043/002	500-0508	0000	0000	0001
003	SWITCH, HI DEN /C/	043/043/003	102357-20	0000	0000	0001
004	TAPE CLEANER /C/	043/043/004	100811-01	0000	0000	0001
005	WRITE LOCKOUT ASSY. /C/	043/043/005	100817-02	0000	0001	0000
006	SHUTTER	043/043/006	100925-01	0000	0000	0001
007	FILTER , MOTOR ASSY.	043/043/007	102245-01	0000	0000	0001
008	HUB ASSY.	043/043/008	102261-02	0000	0000	0001
009	GUIDE ROLLER ASSY./HI/	043/043/009	102264-01	0000	0001	0000
010	ARM RETRACTOR CAM	043/043/010	102296-01	0000	0000	0001
011	PULLEY, ARM DRIVES	043/043/011	102297-01	0000	0000	0001
012	ARM RETRACTOR CABLE	043/043/012	102305-01	0000	0000	0002
013	PHOTO TAB SENSOR	043/043/013	102320-01	0000	0000	0002
014	TENSION ARMSENSOR ASSY.	043/043/014	102324-01	0000	0000	0002
015	HEAD GUIDES /MATCHED PAIRS/	043/043/015	100810-01	0000	0000	0001
016	CAPSTAN	043/043/016	102354-01	0000	0000	0001
017	SWITCH, POWER /C/	043/043/017	505-1807	0000	0000	0001
018	SWITCH, LOAD /C/	043/043/018	102357-16	0000	0000	0001
019	SWITCH, ON LINE /C/	043/043/019	102357-17	0000	0000	0001
020	SWITCH, REWIND /C/	043/043/020	102357-18	0000	0000	0001
021	SWITCH, WRT EN /C/	043/043/021	102357-19	0000	0000	0001
022	SWITCH, RESET /C/	043/043/022	102357-23	0000	0000	0001

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	SPRING, ARM RETRACTOR /C/	043/043/023	102373-01	0000	0000	0001
024	REEL MOTOR ASSY.	043/043/024	102410-02	0000	0000	0001
025	FLUX GATE /O/	043/043/025	102581-01	0000	0000	0002
026	CAM INTERLOCK	043/043/026	103547-01	0000	0000	0001
027	GUIDE ROLLER ASSY. /LONG/	043/043/027	103564-01	0000	0000	0001
028	GUIDE ROLLER ASSY. /SHORT/	043/043/028	103564-02	0000	0000	0001
029	RESISTOR PACK /TERMINATOR/	043/043/029	120-0001	0000	0000	0001
030	ARM RETRACTOR MOTOR	043/043/030	500-0002	0000	0000	0001
031	SWITCH, ROLLER ARM /C/	043/043/031	506-6360	0000	0000	0001
032	SCREW, ARM PULLEY INTERLOCK	043/043/032	602-0410	0000	0000	0001
033	SCREW, SET, ARM RETRACTABLE	043/043/033	603-0005	0000	0000	0001
034	TIMING BELT /C/	043/043/034	610-0020	0000	0000	0001
035	POWER SUPPLY	043/043/035	102268-01	0000	0000	0001
036	RECTIFIER, BRIDGE, 10A, 100V /C/	043/043/036	230-9802	0000	0000	0001
037	TRANSFORMER	043/043/037	511-0001	0000	0000	0001
038	RELAY K2 /75 IPS ONLY/	043/034/038	502-1243	0000	0000	0001
039	POWER TRANSISTOR ASSY.	043/043/039	102316-01	0000	0000	0001

REVISION NUMBER:

DATE: 30/03/76 ASSY. NR: 043/046/0

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DESCRIPTION: 9 CH PERTEC TAPE DRIVE 6000

FOR OTHER ITEMS SEF 043/023/0

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	DATA E19	043/046/001	101711.07	1 2	0001	0003
002	HEAD 9TRK	043/046/002	510.6189	0000	0001	0002

REVISION NUMBER:

DATE: 30/03/76 ASSY. NR: 043/047/0

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DESCRIPTION: 7CH PERTEC TAPE DECK /6000/

FOR OTHER ITEMS SEE 043/023/0

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	DATA E 17	043/047/001	101716.07	1 2	0001	0003
002	SWITCH "HI DEN" /C/	043/047/002	505.1807	0000	0001	0002
003	HEAD 7 TRK /O/	043/047/003	510.6187	0000	0001	0002

REVISION NUMBER:

DATE: 30/03/76 ASSY. NR: 045/015/0

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DESCRIPTION: CENTRONICS 101A PRINTER

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	SOLENOID ASSY. /O/	045/015/001	63002476.4	0000	0001	0001
002	POWER DRIVE BOARD	045/015/002	63002242	0000	0001	0001
003	FIBRE OPTICS HEAD /O/	045/015/003	63002248.2	0000	0001	0001
004	RIBBON GUIDE CAP /C/	045/015/004	63002294	0000	0000	0005
005	ELECTRONIC CARD 1	045/015/005	63002302-1	0000	0001	0001
006	ELECTRONIC CARD 2	045/015/006	63002303	0000	0001	0001
007	+-VOLT REGULATOR	045/015/007	63002304	0000	0001	0001
008	+5 VOLT REGULATOR	045/015/008	63011142-4	0000	0001	0001
009	VIDEO LAMP CABLE /O/	045/015/009	63002306-1	0000	0000	0002
010	PRINT HEAD ASSY.	045/015/010	63002437-4	0000	0001	0004
011	'C' RING KIT /C/	045/015/011	63002343	0000	0000	0002
012	SET SCREW KIT /C/	045/015/012	63002344	0000	0000	0002
013	METRIC HARDWARE /C/	045/015/013	63002345	0000	0000	0001
014	VIDEO LAMP /GE 379//C/	045/015/014	37253790	0000	0001	0005
015	SPRING /C/	045/015/015	507293001	0000	0000	0005
016	SPRING /C/	045/015/016	5100620001	0000	0000	0005
017	SPRING /C/	045/015/017	511091001	0000	0000	0005
018	SPRING /C/	045/015/018	512462001	0000	0000	0005
019	SPRING /C/	045/015/019	512463001	0000	0000	0005
020	MAIN DRIWE BELT /O/	045/015/020	525029001	0000	0000	0002
021	STARTING CAPACITOR /C/	045/015/021	525064001	0000	0002	0000
022	INT PULLY WITH GEAR /C/	045/015/022	525069001	0000	0000	0001

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	INT PULLY FOR FWD CLUTCH /C/	045/015/023	525076001	0000	0000	0001
024	FWD ROTOR /O/	045/015/024	527376001-	0000	0000	0001
025	SPRING DRUM UNIT	045/015/025	525108001	0000	0000	0001
026	DAMPER ASSY.	045/015/026	525123001	0000	0000	0001
027	BUSHING	045/015/027	525155001	0000	0000	0002
028	PISTON/R/ /C/	045/015/028	525198001	0000	0000	0001
029	PLATEN KNOB ASSY	045/015/032	529316001-	0000	0000	0002
030	SPRING /C/	045/015/033	525237001	0000	0000	0005
031	PAPER OUT SWITCH /C/	045/015/034	525272001	0000	0000	0002
032	PIN FEED MECH. /R/	045/015/035	525280001	0000	0000	0002
033	SPRING /C/	045/015/036	525298001	0000	0000	0005
034	PIN FEED MECH . /L/	045/015/037	525304001	0000	0000	0002
035	FORM FEED UNIT	045/015/038	529217001-	0000	0000	0001
036	TIMING BELT /C/	045/015/039	525346001	0000	0000	0002
037	FORM FEED SOLENOID /O/	045/015/040	525352001	0000	0000	0002
038	CLUTCH SPRING /C/	045/015/041	525394001	0000	0000	0005
039	SPRING /C/	045/015/042	525399001	0000	0000	0005
040	BEVEL GEAR /C/	045/015/043	525411001	0000	0000	0003
041	BEVEL GEAR /R/ /C/	045/015/044	525435001	0000	0000	0002
042	BEVEL GEAR /L/ /C/	045/015/045	525454001	0000	0000	0002
043	SWITCH ON/OFF /C/	045/015/046	525492001	0000	0000	0002
044	SWITCH 'SELECT' /C/	045/015/047	525493001	0000	0000	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
045	SWITCH 'TOP OF FORM' /C/	045/015/048	525494001	0000	0000	0002
046	SWITCH 'FORMS OVERRIDE' /C/	045/015/049	525495001	0000	0000	0002
047	RIBBON HOLDING PLATE /L R/ /C/	045/015/050	525437001	0000	0000	0004
048	SPRING /C/	045/015/051	525661001	0000	0000	0005
049	DAMPER CUSHION /C/	045/015/052	525669000	0000	0000	0005
050	TIMING BELT 130 XL /R/ /C/	045/015/053	525671001	0000	0000	0002
051	TIMING BELT 100 XL F /C/	045/015/054	525672001	0000	0000	0002
052	ARMATURE /C/	045/015/055	525709001	0000	0000	0004
053	PULLEY FWD REV CLUTCH /C/	045/015/056	525711001	0000	0000	0001
054	FORWARD CLUTCH UNIT	045/015/057	525712001	0000	0000	0001
055	SPRING /C/	045/015/058	525716001	0000	0000	0005
056	LIMIT SWITCH REED /C/	045/015/059	525721001	0000	0000	0002
057	INT.SHAFT WITH PULLEY /C/	045/015/060	525726001	0000	0000	0002
058	PAPER FEED KNOB /C/	045/015/061	525764001	0000	0000	0002
059	COLLAR /C/	045/015/062	525766001	0000	0000	0002
060	COUPLER /C/	045/015/063	525769001	0000	0000	0002
061	SLEEVE /C/	045/015/064	525770001	0000	0000	0002
062	SHAFT /C/	045/015/065	527081001-	0000	0000	0002
063	FORM FEED MAGNET /C/	045/015/066	525812001	0000	0000	0002
064	MAIN MOTOR	045/015/067	525836001	0000	0000	0001
065	FAN BLADE /C/	045/015/068	525838001	0000	0000	0001
066	MOTOR PULLEY 60 HZ /C/	045/015/069	525841001	0000	0000	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
067	MOTOR PULLEY 50 HZ /C/	045/015/070	527035001-	0000	0000	0001
068	TIMING FENCE /O/	045/015/071	63002585-6	0000	0000	0002
069	ROTOR REV.	045/015/072	525890001	0000	0000	0001
070	DAMPER CAPS /C/	045/015/073	525919001	0000	0000	0005
071	SPRING /C/	045/015/074	551171001	0000	0000	0005
072	RIBBON /C/	045/015/075	6302293-50	0000	0000	0010
073	FAN MOTOR ASSY.	045/015/076	32810000	0000	0001	0004
074	FORM FEED MOTOR WITH FAN	045/015/077	325319001	0000	0001	0000
075	PIN FEED BELT UNIT	045/015/078	325300001	0000	0000	0001
076	CARRIAGE STOPPER LEVER UNIT /C/	045/015/079	525921001	0000	0000	0001
077	BRACKET /FRONT/ /C/	045/015/080	525120001	0000	0000	0001
078	BRACKET /REAR/ /C/	045/015/081	525121001	0000	0000	0001
079	PAWL /C/	045/015/082	525122001	0000	0000	0001
080	F.F.CLUTCH UNIT	045/015/083	525329001	0000	0000	0001
081	TENSION ROLLER	045/015/084	525473001	0000	0000	0001
082	RIBBON HOLDING PLATE W.PAD	045/015/085	525611001	0000	0000	0001
083	READER LAMP UNIT	045/015/086	525367001	0000	0000	0001
084	F.F.CLUTCH MAG UNIT	045/015/087	525347001	0000	0000	0001
085	READER PCB UNIT	045/015/088	525378001	0000	0000	0001
086	TAPE READER UNIT	045/015/089	525375001	0000	0000	0001
087	BEVEL GFAR /C/	045/015/090	525400001	0000	0000	0005
088	CLUTCH FIELD ASSLY	045/015/091	525095001	0000	0000	0001
089	FELT WASHER	045/015/092	525071001	0000	0000	0005

REVISION NUMBER:

DATE: 03/03/76 ASSY. NR: 045/016/0

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DESCRIPTION: LINE PRINTER V-132C

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	POWER SENSOR	045/016/001	32502	0000	0001	0002
002	RIBBON CONTROL	045/016/002	C2628	0000	0001	0002
003	HAMMER DRIVER	045/016/003	C2601	0000	0001	0002
004	LEVEL CONVERTER	045/016/004	C2615	0000	0001	0002
005	DATA INPUT CONTROL	045/016/005	C2603	0000	0001	0002
006	COMPARE OUTPUT	045/016/006	C2604	0000	0001	0002
007	PAPER FEED CONTROL	045/016/007	C2613	0000	0001	0002
008	MEMORY CONTROL	045/016/008	C2622	0000	0001	0002
009	MEMORY P.C.R.	045/016/009	2623	0000	0001	0002
010	PRINT CONTROL	045/016/010	C2619	0000	0001	0002
011	VF CONTROL LOGIC	045/016/011	C2612	0000	0001	0002
012	SEQUENCER ASSLY	045/016/012	D8500G1	0000	0001	0002
013	SOLENOID LINK SPACE ASSLY	045/016/013	85173	0000	0001	0002
014	UPPER SENSOR ASSLY	045/016/014	B5162G2	0000	0001	0002
015	LOWER SENSOR ASSLY	045/016/015	B5163G2	0000	0001	0002
016	BELT /C/	045/016/021	VB-1/89010	0000	0001	0001
017	BELT /C/	045/016/022	VB-2 /9010	0000	0001	0001
018	BELT /C/	045/016/023	VB-3/8902	0000	0001	0001
019	BELT /C/	045/016/024	VB-4/89020	0000	0001	0001
020	BELT /C/	045/016/025	VB-5/89020	0000	0001	0001
021	BELT TIMING /C/	045/016/026	A6104	0000	0001	0001
022	ACTUATOR STRAIGHT /C/	045/016/027	B3034	0000	0000	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	ACTUATOR OFFSET /C/	045/016/028	B.3035	0000	0002	0010
024	HAMMER ODD G.1 /C/	045/016/029	B.3043	0000	0002	0010
025	HAMMER EVEN G.2 /C/	045/016/030	B.3043	0000	0002	0010
026	RELUCTANCE PICK UP /C/	045/016/031	RP-1	0000	0000	0002
027	BELT PAPER FEED TRACTOR /C/	045/016/032	B.4239	0000	0000	0002
028	PIN TRACTOR PAPER FEED /C/	045/016/033	A.4238	0000	0000	0100
029	PULSE RATCHET P.F.	045/016/034	B.6077	0000	0000	0001
030	PULSE RATCHET /C/	045/016/035	B.1300	0000	0000	0001
031	LAMP /C/	045/016/036	G.E. 387	0000	0002	0010
032	LAMP VFU /C/	045/016/037	999079.15	0000	0002	0010
033	EXTENDER P.C.B. /O/	045/016/045	2609	0000	0001	0001
034	FAN CABLE S.A./O/	045/016/046	P.8267	0000	0000	0001
035	FAN ROTRON /C/	045/016/047	747	0000	0001	0001
036	RELAY /C/	045/016/048	91252.237	0000	0001	0005
037	SENSOR LAMP /045.016.036/ /C/	045/016/049	D4501	0000	0001	0001
038	SOLENOID /C/	045/016/050	B5131	0000	0001	0001
039	MOTOR LUGGED	045/016/051	B6141	0000	0000	0002
040	PAPER FEED ENGINE	045/016/052	D4002	0000	0000	0001
041	POWER SUPPLY	045/016/053	D8505	0000	0000	0001
042	RIBBON /C/	045/016/054	55000.4	0000	0000	0010
043	FEED PAWL	045/016/055	B5096	0000	0000	0002

REVISION NUMBER:

DATE: 30/03/76 ASSY. 045/025/0

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DESCRIPTION: ENM SERIAL PRINTER MODEL 100 165 CPS

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	RELT 162T x 1/4" /C/	045/025/001	430.127.1	0000	0001	0002
002	COUPLING /C/	045/025/002	430.128.9	0000	0000	0003
003	BELT 214T x 1/2" /C/	045/025/003	430.135.4	0000	0001	0002
004	SPRING DRUM ASSY.	045/025/004	440.139.4	0000	0001	0005
005	RIBBON GROUP BLK ALUMINYL /C/	045/025/005	GROUP 1	0000	0000	0010
006	ROM ECS /NS 7149/ /C/	045/025/006	140.139	0000	0000	0005
007	PUSH BUTTON CAP ON/OFF /C/	045/025/007	420.247.9	0000	0000	0003
008	PUSH BUTTON CAP ON LINE /C/	045/025/008	420.253.7	0000	0000	0003
009	PUSH BUTTON CAP TOP FORM /C/	045/025/009	420.249.5	0000	0000	0003
010	PUSH BUTTON CAP PSB /C/	045/025/010	420.248.7	0000	0000	0003
011	PUSH BUTTON CAP LF AUTO /C/	045/025/011	420.250.3	0000	0000	0003
012	PUSH BUTTON CAP PAP OUT /C/	045/025/012	420.251.1	0000	0000	0003
013	PHOTOCELL WIRING	045/025/013	240.030.7	0000	0000	0003
014	SPRING /C/	045/025/014	420.323.8	0000	0000	0005
015	BRUSH LEVER SPRING /C/	045/025/015	420.335.2	0000	0000	0005
016	MICRO SWITCH /C/	045/025/016	130.134.0	0000	0000	0005
017	MINIATURE MAINS PLUG /C/	045/025/017	130.003.7	0000	0000	0005
018	MAINS FUSE 10A /C/	045/025/018	570/001/0	0000	0000	0000
019	FUSE 2.5A /C/	045/025/019	570/032/3	0000	0000	0000
020	MICRO SWITCH /C/	045/025/020	130.116.7	0000	0000	0002
021	"O" RING /C/	045/025/021	430.130.5	0000	0000	0005
022	P.E. CELL /C/	045/025/022	230.020.0	0000	0000	0002

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	FUSE 4 AMP /C/	045/025/023	570/055/0	0000	0000	0025
024	FUSE 1.6A /C/	045/025/024	570/005/2	0000	0000	0025
025	FUSE 10A S/B /C/	045/025/025	570/012/3	0000	0000	0025
026	LAMP 14V .04 AMP /C/	045/025/026	130.088.8	0000	0005	0050
027	PRINT HEAD ASSEMBLY	045/025/027	350.008.9	0000	0001	0005
028	DISPLAY ASSEMBLY	045/025/028	350 .011.3	0000	0000	0001
029	TAPE READER UNIT	045/025/029	350.010.5	0000	0000	0001
030	POWER SUPPLY ASSEMBLY	045/025/030	350.012.1	0000	0001	0001
031	BOWDEN CABLE ASSEMBLY /C/	045/025/031	440.182.4	0000	0000	0001
032	BRUSH PIVOIT ASSEMBLY /C/	045/025/032	440.183.2	0000	0000	0002
033	RECTIFIER PCB ASSEMBLY	045/025/033	240.021.6	0000	0000	0002
034	MAINS FILTER ASSEMBLY /O/	045/025/034	140.029.0	0000	0000	0001
035	VOLTAGE SELECTOR /C/	045/025/035	130.118.3	0000	0000	0001
036	PC BOARD 4 ASSEMBLY	045/025/036	240.025.7	0000	0001	0002
037	PC BOARD 3 ASSEMBLY	045/025/037	240.024.0	0000	0001	0002
038	PC BOARD 2 ASSEMBLY	045/025/038	240.023.2	0000	0001	0002
039	PC BOARD 1 ASSEMBLY	045/025/039	240.022.4	0000	0001	0002
040	DISPLAY PANEL	045/025/040	420.296.6	0000	0000	0001
041	SPEAKER CONTROL PCB ASSEMBLY	045/025/041	250.015.5	0000	0000	0001
042	PLATEN ASSEMBLY	045/025/042	450.026.0	0000	0000	0002
043	RIBBON GUIDE RH ASSEMBLY /C/	045/025/043	440.184.0	0000	0000	0003
044	RIBBON GUIDE LH ASSEMBLY /C/	045/025/044	440.185.7	0000	0000	0003

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
045	CLUTCH RIBBON BRKT.ASSY. LH	045/025/045	440.163.4	0000	0000	0002
046	PHOTOCELL FLEXIBLE CCTS ASSY	045/025/046	240.028.1	0000	0000	0002
047	FLEXIBLE CABLE CLAMP	045/025/047	420.268.5	0000	0000	0002
048	CLUTCH RIBBON BRKT.ASSY.RH	045/025/048	440.169.1	0000	0000	0002
049	L.H. BRACKET ASSEMBLY	045/025/049	440.186.5	0000	0000	0002
050	COMB /C/	045/025/050	420.316.2	0000	0000	0002
051	DASHPOT ASSEMBLY	045/025/051	450.022.9	0000	0000	0005
052	MOTOR	045/025/052	130.063.1	0000	0000	0002
053	CABLE CLUTCH ASSEMBLY	045/025/053	440.187.3	0000	0000	0002
054	WASHER /C/	045/025/054	420 .317.0	0000	0000	0010
055	SPRING /C/	045/025/055	420.318.8	0000	0000	0010
056	ADJUSTABLE TRACTORFRAME ASSY.	045/025/056	440.188.1	0000	0000	0001
057	DETENT SPRING /C/	045/025/057	420.319.6	0000	0000	0005
058	TAPE LATCH /C/	045/025/058	420.320.4	0000	0000	0002
059	LATCH PIVOT /C/	045/025/059	420.321.2	0000	0000	0002
060	TORTION SPRING /C/	045/025/060	420.322.0	0000	0000	0005
061	BODY SHAFT SPROCKET ASSY. /C/	045/025/061	440 .189.9	0000	0000	0001
062	TAPE READER COVER ASSY.	045/025/062	440.193.1	0000	0000	0000
063	TRANSFORMER CONNECTOR ASSY.	045/025/063	140.045.6	0000	0000	0001
064	INDEX LEVER ASSEMBLY /C/	045/025/064	440.194.9	0000	0000	0001
065	SHIM /C/	045/025/065	710.186.8	0000	0000	0010
066	MAINS CABLE /C/	045/025/066	130.132.4	0000	0000	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
067	CAPACITOR 15.000U /C/	045/025/067	130.151.6	0000	0000	0002
068	CAPACITOR 10.000U /C/	045/025/068	130.052.4	0000	0000	0002
069	FAN /C/	045/025/069	130.069.8	0000	0001	0002
070	MINIATURE HOUR METER	045/025/070	130.109.2	0000	0000	0001
071	MAINS SOCKET /C/	045/025/071	130.002.9	0000	0000	0001
072	FUSE HOLDER /C/	045/025/072	130.081.3	0000	0000	0001
073	AUTOMATIC INTERLOCK SW /C/	045/025/073	130.126.6	0000	0000	0001
074	H.F. SUPPRESSION INTERLOCK SW	045/025/074	130.125.8	0000	0000	0001
075	PLUG 37 WAY /C/	045/025/075	130.121.7	0000	0000	0001
076	SWITCH RASE 240V /C/	045/ 025/076	130.113.4	0000	0000	0001
077	SWITCH RASE 24V /C/	045/025/077	130.090.4	0000	0000	0001
078	SWITCH RASE 24V /C/	045/025/078	130.114.2	0000	0000	0001
079	PROXIMITY SWITCH /C/	045/025/079	130.122.5	0000	0000	0001
080	SHIM /C/	045/025/080	430.132.1	0000	0000	0010
081	OPERATING MAGNET /C/	045/025/081	130.123.3	0000	0000	0002
082	BELT 51.T x 1/4"/C/	045/025/082	430.133.9	0000	0001	0001
083	BELT 85.T x 1/4" /C/	045/025/083	430 .134.7	0000	0001	0001
084	CAPACITOR 10.000U /C/	045/025/084	130.135.1	0000	0000	0001
085	LAMP 12V /C/	045/025/085	130.139.9	0000	0005	0010
086	HIGH LEVEL INTERFACE 165 CPS	045/025/086	250.038.7	0000	0001	0002
087	HIGH LEVEL INTERFACE 100 CPS	045/025/087	250.045.2	0000	0000	0001
088	LOW LEVEL INTERFACE 165/USA	045/025/088	250.0 43.7	0000	0000	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
089	LOW LEVEL INTERFACE 100/USA	045/025/0 89	250.044.5	0000	0000	0000
090	LOW LEVEL INTERFACE 165	045/025/090	250.041.1	0000	0001	0002
091	LOW LEVEL INTERFACE 100	045/025/091	250.042.9	0000	0000	0001
092	CENTRONICS INTERFACE PCB	045/025/092	250.047.8	0000	0001	0002
093	MICRO SWITCH /C/	045/025/093	130.444.5	0000	0000	0002

REVISION NUMBER:

RECOMMENDED SPARES FOR: SPARE PARTS CATALOGUE UK

DATE: 30/03/76 ASSY.NR:045/034/0

DESCRIPTION: DATA PRODUCTS MODEL LP-2230 LINE PRINTER

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
001	PCBA, LOGIC	045/034/001	236798-001	0000	0001	0001
002	PCBA, SERVO	045/034/002	235645-001	0000	0001	0001
003	PCBA, HAMMER DRIVER	045/034/003	234005-001	0000	0001	0001
004	PCBA, REGULATOR	045/034/004	235030-001	0000	0001	0001
005	MARK IVB HAMMER	045/034/005	233433-001	0000	0001	0001
006	FUSE 8 AMP /C/	045/034/006	570/242/0	0000	0000	0000
007	FUSE 15 AMP /C/	045/034/007	570/013/0	0000	0000	0000
008	INDICATOR LAMP /C/	045/034/008	800785-002	0000	0005	0005
009	RACKSTOP SCREWS	045/034/009	232347-001	0000	0000	0003
010	BELT, PAPER FFED /C/	045/034/010	800299-003	0000	0001	0001
011	BELT, DRUM DRIVE 64 /C/	045/034/011	800104-002	0000	0001	0001
012	RIBBON MOTOR	045/034/012	801148-001	0000	0000	0002
013	TRIAC T27008 /C/	045/034/013	801144-001	0000	0001	0002
014	PCBA/IO	045/034/014	235570-001	0000	0001	0001
015	CCA, CONTROL PANEL	045/034/015	235612-001	0000	0000	0002
016	DRUM MOTOR	045/034/016	800954-001	0000	0000	0002
017	PAPER FEED MOTOR ASSY.	045/034/017	235145-001	0000	0000	0001
018	DISC ENCODER	045/034/018	233367-001	0000	0000	0001
019	BLOWER	045/034/019	801117-001	0000	0001	0001
020	PAPER OUT SWITCH LOWER /C/	045/034/020	237403-001	0000	0001	0001
021	LIMIT SWITCH ASSY.L/H	045/034/021	233585-001	0000	0000	0001
022	DRUM GATE SWITCH /C/	045/034/022	800129-001	0000	0000	0001

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
023	DRUM REARING/C/	045/034/023	800625-005	0000	0001	0001
024	CIRCUIT BREAKER /O/	045/034/024	800797-003	0000	0000	0001
025	TRANSDUCER /O/	045/034/025	800153-002	0000	0001	0001
026	CAPACITOR PACK ASSY.	045/034/026	235029-001	0000	0000	0001
027	TRACTOR ASSY.RIGHT HAND	045/034/027	236811-001	0000	0000	0001
028	TRACTOR ASSY. LEFT HAND	045/034/028	236811-002	0000	0000	0001
029	COIL ASSY. /O/	045/034/029	801080-002	0000	0000	0001
030	BELT, DRUM DRIVE 96 /C/	045/034/030	800104-003	0000	0001	0001
031	LAMP,LED, VISIBLE /C/	045/034/031	801082-001	0000	0001	0001
032	SPRING ASSY./C/	045/034/032	236843-001	0000	0000	0001
033	SWITCH TOGGLE /C/	045/034/033	800502-003	0000	0001	0001
034	SWITCH, TOGGLE /C/	045/034/034	800502-004	0000	0000	0001
035	HAMMERBANK SENSOR ASSY.	045/034/035	235664-001	0000	0000	0001
036	HAMMERBANK EMITTER ASSY.	045/034/036	235661-001	0000	0000	0001
037	PAPER FEED SENSOR ASSY.	045/034/037	235146-001	0000	0000	0001
038	PAPER FEED EMITTER ASSY.	045/034/038	235580-001	0000	0000	0001
039	RIBBON MOTOR ASSY.	045/034/039	235691-001	0000	0000	0001
040	PCBA, EXERCISER-EXT.	045/034/040	235600-001	0000	0000	0001
041	DIODE /C/	045/034/041	800743-001	0000	0000	0000
042	TRANSISTOR 2N2904 /C/	045/034/042	800089-001	0000	0000	0000
043	TRANSISTOR SN7439 /C/	045/034/043	800019-001	0000	0000	0000
044	TRANSISTOR SN7413	045/034/044	800018-001	0000	0000	0000

ITEM NR	DESCRIPTION	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
045	I/C 9N03/7403 /C/	045/034/045	800480-001	0000	0000	0000
046	I/C 9N74/7474 /C/	045/034/046	800400-001	0000	0000	0000
047	I/C 935PCF7438 /C/	045/034/047	800956-001	0000	0000	0000
048	I/C SN74164N /C/	045/034/048	800698-001	0000	0000	0000
049	I/C S7451MC1458 /C/	045/034/049	800952-001	0000	0000	0000
050	I/C 9N04/7404 /C/	045/034/050	800387-001	0000	0000	0000
051	TRANSISTOR 2N3772 /C/	045/034/051	800497-001	0000	0000	0000
052	TRANSISTOR 2N2905A /C/	045/034/052	800515-001	0000	0000	0000
053	TRANSISTOR 2N3055 /C/	045/034/053	800215-001	0000	0000	0000
054	TRANSISTOR 2N3740/C/	045/034/054	800476-001	0000	0000	0000
055	TRANSISTOR 2N2219A /C/	045/034/055	800231-001	0000	0000	0000
056	TRANSISTOR AADPC205B424	045/034/056	800132-001	0000	0000	0000
057	THYRISTOR N/A /C/	045/034/057	800192-001	0000	0000	0000
058	I/C LM205NH /C/	045/034/058	800499-001	0000	0000	0000
059	DIODE, REG. IN52328111 /C/	045/034/059	800592-001	0000	0000	0000
060	I/C 9603/74121 /C/	045/034/060	800491/001	0000	0000	0000
061	INTEGRATED CIRCUIT S7434 /C/	045/034/061	800399-001	0000	0000	0000
062	I/C 9N76/7476 /C/	045/034/062	800081-001	0000	0000	0000
063	I/C SN7400N /C/	045/034/063	800024-001	0000	0000	0000
064	I/C 93177/74177 /C/	045/034/064	801012-001	0000	0000	0000
065	I/C 9N02/7402 /C/	045/034/065	800080-001	0000	0000	0000
066	I/C SN7410N /C/	045/034/066	800023-001	0000	0000	0000

ITEM NR	DESCRIPTIPON	PART NO	VENDOR REF	LEV 1	LEV 2	LEV 3
067	I/C MM5060 /C/	045/034/067	800940-001	0000	0000	0000
068	I/C SN7406N /C/	045/034/068	800651-001	0000	0000	0000
069	I/C SN74221N /C/	045/034/069	801023-001	0000	0000	0000
070	DIODE IN4003ITT /C/	045/034/070	800095-001	0000	0000	0000
071	TRANSISTOR AA2N4858-5452 /C/	045/034/071	800822-001	0000	0000	0000
072	TRANSISTOR F2N3253430 /C/	045/034/072	800088-001	0000	0000	0000
073	TRANSISTOR AADPC205842 /C/	045/034/073	800132-001	0000	0000	0000
074	I/C SN74123N /C/	045/034/074	800979-001	0000	0000	0000
075	I/C SN72711N /C/	045/034/075	800186-001	0000	0000	0000
076	I/C S7449-7416 /C/	045/034/076	800732-001	0000	0000	0000
077	DIODE REG.6.2V IN827019 /C/	045/034/077	800319-001	0000	0000	0000
078	I/C SN74136N /C/	045/034/078	801014-001	0000	0000	0000
079	I/C 9N20/7420 /C/	045/034/079	800020-001	0000	0000	0000
080	I/C 9N37/7437 /C/	045/034/080	800920-001	0000	0000	0000
081	INTEGRATED CIRCUIT SN7414N /C/	045/034/081	800021-001	0000	0000	0000
082	I/C 9N30/7430 /C/	045/034/082	800959-001	0000	0000	0000
083	12V RELAY	045/034/084	801010-001	0000	0001	0001
084	TRANSFORMER /O/	045/034/085	800942-003	0000	0001	0001
085	TORQUE WRENCH /O/	045/034/086	801131-002	0000	0000	0001
086	SOCKET /O/	045/034/087	237357-001	0000	0001	0001

SYNCHRONOUS LINE CONTROLLER

SYNCHRONOUS LINE UNIT

SINGLE CHANNEL

048–430–0

SYNCHRONOUS LINE CONTROLLER

Description

The Hi Speed Communications controller comprises receiver and transmitter sections each with its own unique instruction set and device code. The transmitter and receiver sections include all the necessary data channel and program interrupt logic to permit independent communication by receiver and transmitter between modem and computer. Hence full duplex operation is possible. The controller board is installed in one I/O slot position and is designed to interface with a Bell 201 or 301 modem (data set).

Normally the controller operates slaved at the clock of the local modem, however, an internal clock option (116420) is available to provide a clock source when modems are not used as the high seed data terminal. In addition jumper selectable parity option 116421 permits either odd, even, or no parity to be appended to each character of the message as it is transmitted, it also checks for the presence of incorrect parity as messages are received. The controller handles data word transfers in 16-bit words with two characters packed to a word. Variable length data registers in both receiver and transmitter allow character lengths from 6 to 8 bits (excluding parity). The character length is selected and set by means of jumpers on the controller board. An automatic answering feature is provided and informs the program when an incoming call is present. This feature is described at the conclusion of the transmitter discussion.

RECEIVER

Programmable Device Registers

ADDRESS COUNTER. This is a 15-bit counter which acts as a pointer to the next location in memory that will receive a data word. The counter is incremented after each data word is transferred to memory.

DATA WORD COUNTER. This is a 12-bit counter which keeps track of the number of data words received. The counter is incremented by one after each data word transfer. The counter is loaded with the two's complement of the number of data words to be received.

SYNC AND TERMINATION CHARACTER REGISTER. This is a 16-bit register which is loaded with an eight bit sync character and an eight bit termination character. The sync character appears in bit positions 0-7 while the termination character is loaded in bit positions 8—15. These characters remain in the register until the program supplies different characters.

DATA WORD ASSEMBLY REGISTER. This is a 16-bit register which assembles and stores the incoming serial data into two characters. The register is variable bit length so it can handle character and parity bit combinations from 6 to 9 bits in length. The character length is set by means of jumper (hardwire) connections. This register is cleared whenever a start command is given in an I/O instruction.

STATUS REGISTER. This is a 5-bit register where each of the five bits represents a unique status flag as described below. Status flags corresponding to bits 11-13 are used for the automatic answering feature associated with modems/data sets. The setting of the status flag does not set the Done flag — These flags can be checked via a DIA-REC instruction.

a) CARRIER ON (DATA BIT 11) — This flag is set by the modem when the modem has received a data carrier.

b) DATA SET READY (DATABIT 12) — This flag sets to indicate that the local modem is connected and is ready to be operated.

c) RING INDICATOR (DATA BIT 13) — This flag is set when an incoming call from a remote station causes the phone to ring.

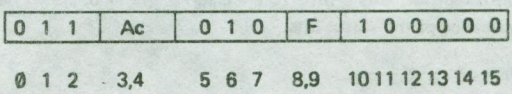
d) PARITY ERROR (DATA BIT 14) — This flag sets when an incorrect parity bit has been detected in the incoming data stream.

e) RECEIVER TIMING ERROR (DATA BIT 15) — This flag sets when the data channel does not respond within one receiver clock period to a data channel request. The flag is set and indicates that a data word has been lost.

RECEIVER INSTRUCTION SET. The following five instructions apply to only the receiver. In all these instructions bits 10-15 specify a device code of 40. When several communications controllers are being used the additional receivers are assigned device codes 42 or 44. Bits 8 and 9 of these instructions specify an operation performed in the receiver subsequent to the data transfer as follows:

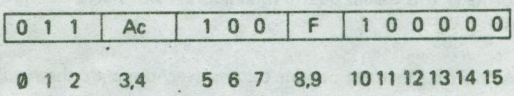
Function	Bits 8,9	Operation
None	00	None
Start	01	Sets BUSY and clears DONE flags placing the device in a busy state. The interrupt request flag and the data word assembly register are also cleared.
Clear	10	Clears BUSY and DONE flags placing device in an idle state. Also clears status flags bits 14 and 15 only.
I/O Pulse	11	Can be used as an optional signal by the user (Not wired for use in present receiver).

DOA-,REC



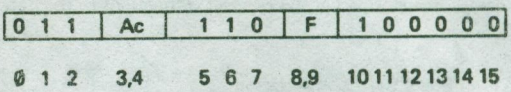
The contents of the accumulator given by bits 3 and 4 are loaded into the sync and termination character register. The accumulator must be first loaded with the desired sync character (in bits 0-7) and with the desired termination character (bits 8-15) prior to issuing this instruction.

DOB-,REC



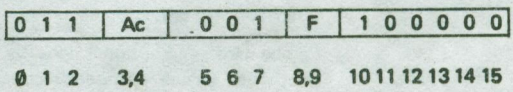
The contents of the accumulator given by bits 3 and 4 are loaded into the address counter. Bit position 1-15 of the accumulator must be first loaded with the initial memory address which will receive the first data word. Bit 0 ignored.

DOC-,REC



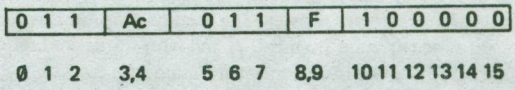
The contents of the accumulator given by bits 3 and 4 are loaded into the data word counter. Bit positions 4-15 of the accumulator must first be loaded with the total number of data words to be transferred and this number must be in two's complement form (negative of the word count). Bit 0-3 are ignored.

DIA-,REC



Bit positions 11 thru 15 of the accumulator, Ac, are loaded with status data from the status register. Bits 0 thru 10 are cleared. Refer to status register for the significance of the status bits.

DIB-,REC



The accumulator, Ac, is loaded with the address word from the address counter. Normally this would be the final address word after receipt of a block transfer.

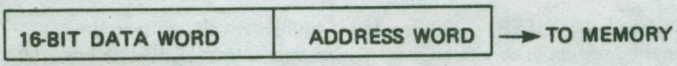
Besides these transfer instructions for the receiver, there are the regular I/O skip instructions, the interrupt acknowledge, mask out, and I/O reset instructions. When the mask out instruction is to be used, mask out bit 8 must be used. The I/O reset instruction has the same effect as a clear but in addition clears the INT DISARM flag.

SETTING UP THE RECEIVER FOR OPERATION

Before the receiver is placed in operation, the program must supply the following: an initial address word to the address counter, a 2's complement data word count to the data word counter, and sync and termination characters to the sync and termination character register. Moreover, before the receiver is started the program may wish to examine the status flags and/or clear the receiver before starting the next data block transfer.

PLACING THE RECEIVER IN OPERATION

The receiver is started by giving a start command in bits 8,9 of the function field of either an I/O instruction or a NIO instruction. Once started the data word assembly register is immediately cleared and the incoming serial data from the local modem (or high speed terminal) is assembled into a 16-bit data word. Upon the successful detection of two sync characters in tandem, the receiver is then prepared to issue a data channel request for each subsequent 16-bit data word received. After each incoming 16-bit data word is assembled a data channel request is made and the receiver waits until the processor returns a data channel acknowledge. If the data channel acknowledge is returned within one receiver clock period the address word together with the 16-bit data word appended to it are sent to memory. For each address and data word sent to memory the data and address word counters are incremented by one.

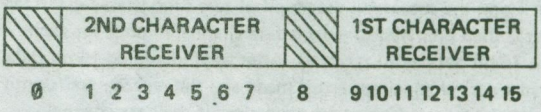


If after a data channel request the processor does not respond with a data channel acknowledge within one receiver clock period (time depends on internal clock of modem) a receiver timing error flag sets and the data word corresponding to that request is lost. The program upon detecting a receiver timing error should request that the complete data block transfer be repeated.

Data flow continues between receiver and memory under control of the data channel with the program free to perform some other operation. When the required number of data words is received, the data word counter overflows and the done flag sets. If the INT Disarm flag is clear an interrupt request is then made. Note that if the exact number of data words in a block transfer

is not known the data word counter should be set to a sufficiently large count to insure that the termination character is detected before an overflow occurs. Detection of the termination character in the data stream causes Done to set and if INT DISARM flag is clear the interrupt flag also sets. The processor after recognizing an interrupt request can determine which device sent it by issuing an interrupt acknowledge instruction and acquiring the device code of the device that sent it, in this case the receiver. At the completion of the transfer the program should retrieve and inspect the status flags and may also obtain the final address count to determine the total number of data words received.

Although 16-bit data words are sent to memory, the data word assembly register packs either 6,7, or 8 bit characters right justified into the 0-7 and 8-15 bit positions of the 16-bit data word. For example, a 7-bit character (6 bits of data and one parity bit or 7 data bits and no parity bit would be packed as follows:



TRANSMITTER

Programmable Device Registers

ADDRESS COUNTER. This is a 15-bit counter which points to the next memory location in core to be read. The counter is incremented by one after each data word transmitted.

DATA WORD COUNTER. This is a 12-bit counter which stores in 2's complement form the number of data words to be transmitted. This counter is incremented by one after each data word is transmitted. When the counter overflows, the Done flag is set.

DATA TERMINAL READY FLAG. When set by the program this one bit flag sends a data terminal ready signal to the local modem in response to a ringing indicator.

REQUEST TO SEND FLAG. This flag when set sends a request to send signal to the local modem. The modem when ready returns a clear to send to the transmitter. This flag is set by a start command and is cleared by an I/O reset instruction.

DATA LATE STATUS BIT (DATA 15). This one bit flag is set when the data channel fails to respond within one transmitter clock period to the transmitter's data channel request. This flag is cleared by start, clear, and I/O reset commands.

TRANSMITTER INSTRUCTION SET. The following five instructions apply to only the transmitter. In all these instructions device code 41 must appear in bit positions 10-15 of the instruction word. When several communications controllers are being used, the additional transmitters may use device codes 43 or 45. Bits 8 and 9 of these instructions specify an operation that is performed in the transmitter subsequent to the data word transfer as follows:

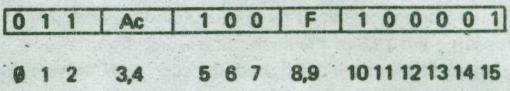
Function	Bits 8,9	Operation
Start	01	Sets Busy and clears Done flags Sets REQ TO SEND flag Clears INTREQ and XMT ERROR flags
Clear	10	Clears Done, INT req, Busy and XMTR Error flags
I/O RESET	11	Same as clear but in addition clears REQ to Send, INT DISARM and DCH REQ.
None	00	None

ODA-,XMT

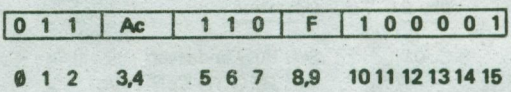
0 1 1	Ac	0 1 0	F	1 0 0 0 0 1
Ø 1 2	3,4	5 6 7	8,9	10 11 12 13 14 15

This instruction is used to control the DATA READY SIGNAL at the transmitter. If bit position 15 of the accumulator specified by Ac is 1, then a DATA TERMINAL READY signal is generated. If bit position 15 is 0, then the DATA TERMINAL READY signal is terminated. This instruction is used with automatic answering.

DOB-,XMT

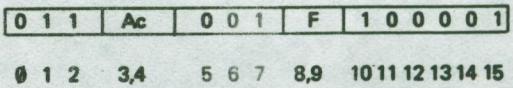


Bit positions 1-15 of the accumulator specified by Ac field is transferred to the address counter in the transmitter.



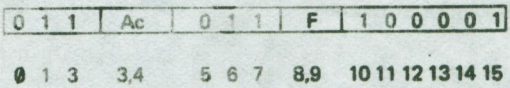
The contents of bit positions 4-15 of the accumulator specified by Ac is transferred to the word counter.

DIA-,XMT



Bit 15 of the accumulator specified by Ac is loaded with the value of the data late status flag. When the data late status flag is set, a 1 is entered into bit position 15 and indicates that the data channel has failed to respond in time to a data channel request and a data word was lost.

DIB-,XMT



The accumulator specified by the Ac field is loaded with the address word contained in the address counter. Bit 0 is cleared.

Besides these transfer instructions for the transmitter, there are the regular I/O skip instructions, the interrupt acknowledge, mask out, and I/O reset instructions. When the mask out instruction is to be used, mask out bit 8 must be used. The I/O reset instruction has the same effect as a clear but in addition clears the INT DISARM flag.

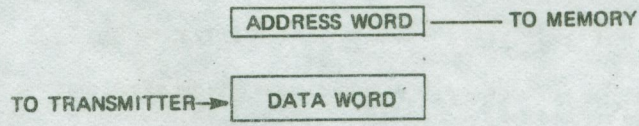
SETTING UP THE TRANSMITTER FOR OPERATION

Before the transmitter is placed in operation, the program must supply an initial address word to the address counter and a data word count in 2's complement form to the data word counter. Moreover, before the transmitter is started the program may wish to check status bit DATA15 and/or clear the transmitter before the next operation.

PLACING THE TRANSMITTER IN OPERATION

The transmitter is placed in operation by giving a start command in bits 8 and 9 of a regular I/O instruction. The start command sets Busy clears Done and sets a Request to Send flag. The Request to Send flag immediately sends a request to send signal to the local modem. The transmitter waits for a clear to send signal from the modem and once this is received, transmitter clocks are turned and the transmitter begins running.

With the clocks turned on, a data channel request is made and the processor has one transmitter clock period to respond to the request. The processor responds by returning a data channel acknowledge. The data channel acknowledge places on the I/O bus the initial address word which is immediately used to read out of core the data word to be transmitted. The 16-bit word is then parallel loaded into the variable length serial shift register. At this time, if parity option is used, low and high parity bits are inserted just prior to the low order (bits 0-7) and high order (bits 8-15) bit positions of the data word. Since this register is of variable length it can accomodate characters from 6 to 8 bits in length (not including parity bit). As each data word is loaded into the register the address and data word counters are incremented by one.



Data word transfers continue until the data word counter overflows at which time Done sets and provided the Interrupt Disarm flag is clear an interrupt request is made.

Note that if the processor fails to respond to a data channel request within one transmitter clock period, a Data Late status bit is set and the data word is lost. Setting this flag does not set the Done flag so the program should check the status bit after each transmission and if it is found to be set repeat the data transmission.

When an interrupt request is made by the transmitter, the program has two character times to provide another initial address word to the address counter and another data word count to the data word-counter and start the transmitter without going out of sync. If the transmitter does not respond within the two character times the Request to Send flag clears and sync must be again established before subsequent data transmissions can continue.

AUTOMATIC ANSWERING FEATURE

The automatic answering feature allows the program to inspect a ringing indicator status flag in the receiver. When this flag is set, an incoming call is indicated and the program can respond by setting a data terminal ready flag in the transmitter. The program responds to a call and can terminate a call by setting or clearing the data terminal ready flag in the transmitter.

JUMPER WIRE CONNECTIONS. Table 1 lists the jumper connections required for each character length with parity (odd or even) and without parity. Table 2 gives the jumpers (already installed) for receiver device code 40 and transmitter device code 41. The jumper connection for a second controller is also given.

TABLE 1 – CHARACTER LENGTH AND PARITY JUMPER CONNECTIONS

JUMPERS TO BE PUT IN FOR DIFFERENT VERSIONS	CHARACTER	WITH PARITY		WITHOUT PARITY
		ODD	EVEN	
AK, ZZ, MM, DD, U, T, S, AP, AH, AE, BB, Z	6 Bit	–	–	NO PARITY
AN, YY, AW, NN, EE, V, T, KK, AH, AE, BB, Z, AU	6 Bit	ODD	–	–
AN, YY, AW, NN, EE, V, T, KK, AH, AE, BB, Z, AT, AB, AX	6 Bit	–	EVEN	–
AL, YY, AV, NN, EE, V, KK, T, AH, AE, BB, Z, AP	7 Bit	–	–	NO PARITY
AL, XX, AM, AW, TT, PP, EE, X, JJ, FF, AU, AD, AH, Y, BB	7 Bit	ODD	–	–
AL, XX, AM, AW, TT, PP, EE, X, JJ, FF, AT, AB, AX, AD AH, Y, BB	7 Bit	–	EVEN	–
AL, WW, AM, TT, VV, PP, EE, FF, JJ, X, AE, AH, BB, Z, AP	8 Bit	–	–	NO PARITY
AL, AJ, XX, UU, AW, SS, EE, W, LL, HH, AF, AD, AA, Y, AU	8 Bit	ODD	–	–
AL, AJ, XX, UU, AW, SS, EE, W, LL, HH, AF, AD, AA, Y, AB, AX, AT	8 Bit	–	EVEN	–

TABLE 2 – DEVICE CODE JUMPER CONNECTIONS
For transmitter device code 41 and receiver device code 40 the following jumpers are installed: H, K, M, P For second communications controller board using device code 43 (XMTR) and 42 (RCVR) add jumper D.

Wire Run List for Internal Cable Assembly 800100
(Used with Synch Communications Controller)

1 FROM	SIGNAL NAME	TO (WIRE WRAPPED TO CONNECTOR PANEL PIN NO.)
J1–4	REQUEST TO SEND	B69
J1–11	INT CLOCK (OPTION)	B67
J1–18	DATA TERMINAL READY	B49
J1–17	SCR CLOCK	B51
J1–2	SEND DATA	B53
J1–3	RECEIVE DATA	B52
J1–5	CLEAR TO SEND	B54
J1–15	XMIT SERIAL CLK	B34
J1–19	RING INDICATOR	B36
J1–8	CARRIER ON	B38
J1–6	DATA SET READY	B40
J1–1	GRD (BLK)	B1
J1–7	GRD (BLK)	B2

1 Connector J1 is DCC P/N 008425-2 (2 DE-19S)

OPERATIONS

RESCUE PROCEDURE RELEASE 7

1. Take a system save of current system.
2. Unassign all value tables.
3. Write all libraries to tape to be sure they are current.
4. Mount a large scratch tape with a write ring.
5. Check rescue program. It should be exactly as follows:

   When batch output <label> '!' <Job> <Batch>.
   Output <PGM> <All>.
   Terminate this program.

   With scratch tape mounted and program checked, perform the following:

   A. go to supervisor mode
   B. select B (batch I/O operations)
   C. select B (write a batch)
   D. output device Tn
      Record size (4000 if 4K buffer) (2000 if 2K) (1000 if 1K)
      Block size (4000 2000 1000)
      Fixed length N
      Blocked Records Y
      Character count
      Pads character
      Code set
      output prgm Rescue
      Batch name**********

6. Names will display on the terminal screen; keep hitting release to display all names. At final hit rel. to proceed message, hit rel. and tape will now move and data will output.
7. When tape is finished outputting, manually write a tape mark and rewind.
8. Put up new master tape and cold start into the system.
9. Load library tape and read all libraries.
10. Now mount the rescue data tape and select batch operations and select "H". Read tape with standard job header. When code set is on screen, turn auto on before hitting rel. and rel.

    NOTE: When auto is on and batches are being read in, auto will enable the entire tape in operation to go from start to finish without stopping after each batch.

11. After tape reads in, a small warms will be done, then job is finished. Assign value tables and op stats and system is ready.

AUTOMATIC BATCH LOAD (ABL)

ABL provides the Seecheck User with the ability to transfer disk resident data batches, batch statistics, operator ID's, and operator statistics from any Seecheck utilizing Release VIIB/VIIC to any other Seecheck System utilizing software Release VIIC. This feature is desirable in two separate instances:

- Upgrading From One Software Release to Another – Users currently operating with software Release VIIB may utilize this feature to upgrade their system to software Release VIIC.
- Batch Recovery During System Failure – If a Seecheck, utilizing software Release VIIC, is malfunctioning to the extent that a warm start or system save cannot be executed, the User may tulize the Automatic Batch Load procedure in an attempt to recover disk resident data, thus avoiding the use of a system save for backup purposes.

General Operating Parameters

The following parameters are pertinent to the operation of the Automatic Batch Load feature of Seecheck. Successful execution of this feature is dependent on a complete understanding of these parameters.

- Automatic Batch Load is a feature of software Release VIIC only. Although disk resident data batches, batch statistics, operator ID's, and operator statistics can be retrieved with the aid of the ABL feature from a system utilizing software Release VIIB, this data will **only** be accepted by a system utlizing software Release VIIC.
- The program required to retrieve disk resident batches, batch statistics, operator ID's, and operator statistics is a stand-alone program which is not system resident. Therefore, a Master ABL Generator Tape must be cold started to activate the ABL feature.
- Once the Master ABL Generator Tape has been cold started and the cold start operation completed, a scratch tape must be mounted on the **same** tape drive for the purpose of retrieving all disk resident data batches, batch status, operator ID's, and operator statistics data. This tape then becomes an ABL Data Tape. Note – Libraries are not retrieved by this operation.
- Loading an ABL data tape requires, as a minimum, that corresponding input formats be present in the system; however, it is also desirable to have corresponding Record End/Batch End Edit Routines and standard job formats within the system for the purpose of validating

data as it is read back into the system via the ABL data tape. Therefore, it is imperative that Users maintain an up to date library tape.

- ABL allows batches to be read from the ABL data tape as long as an input format exists to control entry. Batches not corresponding to an existing input format are skipped.
- During the Automatic Batch Load operation, batches are forced to conform to corresponding input formats. That is, if field and record lengths do not conform to corresponding input formats, ABL will either fill missing characters and fields with error flags or truncate extra characters or fields. If data is truncated, the data position prior to truncation will be filled with an error flag.
- ABL does not allow batches to read from the ABL data tape if those batches already reside in the system; rather, the names of duplicate batches will be entered in an ABL Log.
- If disk capacity reaches the 98 percent mark during an Automatic Batch Load operation, the remaining tape will be searched, and the names of batches and operator statistics remaining on tape will be listed in an ABL Log.
- If an ABL Log is generated during an Auto Batch Load operation, the User may display the log on the SEECHECK Keystation and write the log to tape or printer, or exit. Once the User has selected the Exit option, the ABL Log is deleted, a warm start initiated, and the system returned to normal operation.
- If no ABL Log is generated during an Automatic Batch Load operation, a warm start is automatically executed at the completion of the read operation.
- The ABL Log is used to present messages pertinent to a procedural problem during the Automatic Batch Load operation. ABL Log codes that are specific to a particular batch, edit, or standard job name are preceded by the batch name. Table 1 lists these codes as well as providing definitions. Figure 1 illustrates the format used to write or display the ABL Log.

Batch Name		ABL Log Code
	BATCHNAME1	13
	BATCHNAME2	
	IFNAME01	9
	IFNAME02	9
	REENAME	11
	BATCHNAME2	12
	OPID	

Figure 1 ABL Log Format

ABL Procedure

The following steps should be executed in the indicated order when utilizing ABL to upgrade a Seecheck System from Release VIIB to Release VIIC. Additionally, this procedure can be used to retrieve batches, batch status, operator ID's, and operator statistics from a Seecheck which is experiencing hardware or software difficulties. Refer to the Seecheck Operations Manual for specific information, if any of the steps listed in this procedure are unfamiliar.

NOTE

This procedure is based on the premise that all installations maintain current library and value table resue tapes. If a library tape is not read into the system during this procedure (refer to Step 9), the batches contained on the ABL data tape will not be read into the system. If a value table rescue tape is not read into the system during this procedure (refer to Step 10) and the value tables reassigned, the last character of each value table field will be flagged with an error flag (#), as batches are read into the system.

TABLE 1. ABL LOG CODES AND DEFINITIONS

NUMBER	DEFINITION
1	ABL DATA TAPE GENERATOR MAY NOT HAVE RECOVERED ALL BATCHES.
2	ABL DATA TAPE GENERATOR MAY NOT HAVE RECOVERED ALL OPERATOR ID'S AND STATISTICS.
3	BATCH WAS SKIPPED BY ABL DATA TAPE GENERATOR.
4	AN OPERATOR'S ID AND STATISTICS WERE SKIPPED BY ABL DATA TAPE GENERATOR.
5	BATCH MAY NOT HAVE BEEN COMPLETELY WRITTEN BY ABL DATA TAPE GENERATOR.
6	AN OPERATOR'S STATISTICS MAY NOT HAVE BEEN COMPLETELY WRITTEN BY ABL DATA TAPE GENERATOR.
7	TAPE IS NOT AN ABL TAPE.
8	STANDARD JOB IS NOT DEFINED IN STANDARD JOB LIBRARY.
9	INPUT FORMAT IS NOT DEFINED IN INPUT FORMAT LIBRARY.

TABLE 1. ABL LOG CODES AND DEFINITIONS (Continued)

NUMBER	DEFINITION
10	BATCH END EDIT ROUTINE IS NOT DEFINED IN THE BATCH END EDIT LIBRARY OR CONTAINS ONE OR MORE COMPILATION ERRORS.
11	RECORD END EDIT ROUTINE NOT DEFINED IN THE RECORD END EDIT LIBRARY OR CONTAINS ONE OR MORE COMPILATION ERRORS.
12	NO INPUT FORMAT FOUND TO INITIATE BATCH.
13	BATCH OR OPERATOR ID ALREADY EXISTS.
14	ABL TAPE INPUT HAS BEEN TERMINATED DUE TO TAPE READ ERROR.
15	DISK IS 98% FULL. ALL FURTHER BATCHES AND OPERATOR STATISTICS ON TAPE WILL BE BYPASSED, AND THE NAMES WILL BE LISTED.

1. Create two (2) system saves
2. Ensure that two (2) current library tapes are available. If not available, create two library tapes using the Write Libraries option of the Libraries List.
3. Ensure that two (2) value table rescue tapes are available. If not available, create two value table rescue tapes.

NOTE

Seecheck does not support reading one character records; therefore, all one character value tables will have to be rekeyed (refer to Step 12) during this operation, unless the value table batches are blocked during output.

4. Cold start the Master ABL Generator Tape. This is accomplished in the manner used to cold start a Master System tape or System Save tape.

WARNING

Prior to mounting the Master ABL Generator Tape, ensure that the tape reel does not contain a write ring. If the tape reel contains a write ring while mounted on the tape drive, the Master ABL Generator Tape will be destroyed, and the User will be unable to continue this operation.

5. Upon completion of the cold start operation (Step 4), all DATA/SCOPE Keystations will display the message "MOUNT TAPE ON SAME DRIVE AS MASTER". Once this message is displayed, remove the Master ABL Generator Tape from the tape drive and mount a scratch tape (containing a write ring) on the same tape drive used to cold start the Master ABL Generator Tape.

NOTE

Ensure that the scratch tape will accommodate the volume of data on disk. If the system contains a dual disk and the disk and the disk status is high, a 1200 foot or even a 2400 foot reel of tape will, in all probability, be necessary.

NOTE

Keystrokes will not be accepted by the system during this portion of the ABL operation. The messages "TAPE UNIT NOT READY" and "CHECK WRITE RING" may be displayed on all keystations, if appropriate.

6. Once the scratch tape is mounted on the tape drive and the tape unit is placed ON LINE, the message "AUTO BATCH LOAD DATA TAPE GENERATION" is displayed at all DATA/SCOPE Keystations, and the process of writing all batches, batch statistics, operator ID's, and operator statistics to tape is initiated.
7. When the message "COMPLETED" flashes on all keystations, rewind and remove the ABL data tape from the tape drive and remove the write ring.
8. Cold start a sysgen'ed software Release VIIC Master System tape. **Ensure that this tape does not contain a write ring.**
9. After the Release VIIC Master System Tape has been loaded, mount the libraries tape on the tape unit and read the tape onto disk via the Read All Libraries option of the Libraries List. **Ensure that this tape does not contain a write ring.**
10. Upon completion of the Read All Libraries operation, remove the libraries tape and mount the tape containing value table batches on the tape drive. **Ensure that this tape does not contain a write ring.**
11. Read the value table rescue tape to disk.
12. If applicable, rekey any one character value tables.
13. Reassign value table reference numbers to corresponding batches (Batch Operations List).

NOTE

If this step is not accomplished, all fields specified as numeric only exceptions will be flagged with an error flag.

15. Mount the ABL Data Tape on the tape drive. **Ensure that this tape does not contain a write ring.**

16. Select (L) Auto Batch Load from the System Operations List. This list has been changed as follows to accommodate the ABL feature:

SYSTEM OPERATIONS

A ENTER DATE	G SYSTEM DIAGNOSTICS
B DISK STATUS	H DIAGNOSTIC MODE
C SYSTEM SAVE	I SYSTEM TAPE CODE
D ASSIGN TAPE UNIT	J TYPEWRITER OVERSIGN
E CHANGE PASSWORD	K OPTIMIZE SYSTEM
F NUM ONLY EXCEPT'S	L **AUTO BATCH LOAD**

SELECTION

17. Select the tape drive to be used to read the ABL data tape. Once the tape drive is selected, the ABL data tape is read onto disk.

NOTE

During processing each batch name and operator identification (ID) is displayed on the DATA/SCOPE Keystation that initiated the ABL operation; all other keystations are locked-out. Additionally, an incrementing record count is displaed beside each batch name as the batch is being validated. The amount of time required to read the data contained on the ABL data tape is dependent on the system size; i.e., the number of disks and the amount of data contained on the disks. During a recent test, an ABL data tape containing the data from a dual disk system (63% status) was read back into a Seecheck System in 1 hour and 30 minutes.

18. Once the ABL data tape has been read to disk, remove the tape from the tape drive.

19. If no errors are encountered by the system during the Auto Batch Load operation, the system automatically initiates a warm start. Upon completion of the warm start, the system si required to **normal operation** and all keystations display the Operator HELP List.

20. If one or more errors are encountered by the system during the Auto Batch Load operation, they are stored in an ABL Log. Access to this log is provided by the ABL Log Options List, as follows:

NOTE

The ABL Log is intended to list procedural problems (refer to Table 1) that occur during an Automatic Batch Load operation. Errors encountered within specific batches during ABL (e.g., value table field flagged with error; numeric only exception field flagged with error) are not listed in the ABL Log. If it is desirable to obtain the names of batches containing such errors, the Write Batch Status feature of the Batch I/O Operatios Operations List should be utilized in conjunction with the Batch Status Protection feature of System 480 upon completion of the ABL operation.

SYSTEM OPERATIONS

ABL LOG PRESENT

A WRITE ABL LOG
B EXIT

SELECTION

This display is presented upon completion of the Auto Batch Load operation on the DATA/SCOPE Keystation that initiated the operation.

21. If it is desirable to write the ABL Log, select (A) WRITE ABL LOG and the desired output device (Tape unit 1-4, printer or CRT). Once a device is selected, the system outputs the ABL Log. Upon completion, the ABL Log Options List is redisplayed, and the User may select another output device or exit. If (B) EXIT is selected, the ABL Log is deleted, a warm start is automatically initiated, and the system is returned to normal operation.

Once a system has been upgraded to software Release VIIC, a number of steps must be performed in order to duplicate the system conditions which existed prior to converting to Release VIIC; these steps are:

1. Reinstate desired batch protection requirements (Batch Operations List).
2. Enter system date (System Operations List).
3. Reinstate tape unit assignments, if required (System Operations List).
4. Reinstate supervisor password (System Operations List).

5. Reinstate the name of the code set to be used as system default case (System Operations List).
6. Reinstate typewriter oversign capability, if required (System Operations List).
7. Reinstate system priority assignments (Optimize System. System Operations List).
8. Change all command sequences which utilize the Device From Tape option of the Utility Operations List to reflect the changes to this option offered by Release VIIC.

NOTE

If a batch is in the active or interrupted state prior to the ABL operation, ABL will terminate that batch. If a sort file exists prior to an ABL operation, ABL will delete that sort file.

TAPE OUTPUT CODES IN OCTAL NOTATION

BURROUGHS	CDC External	KEYBOARD Card Punch		NCR EBCDIC	NCR ASCII	BCD	HWELL-7	ICL-7
61 A	61 A	12,1	A	301	101	61	21	35
62 B	62 B	12,2	B	302	102	62	22	36
63 C	63 C	12,3	C	303	103	63	23	37
64 D	64 D	12,4	D	304	104	64	24	30
65 E	65 E	12,5	E	305	105	65	25	31
66 F	66 F	12,6	F	306	106	66	26	32
67 G	67 G	12,7	G	307	107	67	27	33
70 H	70 H	12,8	H	310	110	70	30	24
71 I	71 I	12,9	I	311	111	71	31	25
41 J	41 J	11,1	J	321	112	41	41	26
42 K	42 K	11,2	K	322	113	42	42	27
43 L	43 L	11,3	L	323	114	43	43	20
44 M	44 M	11,4	M	324	115	44	44	21
45 N	45 N	11,5	N	325	116	45	45	22
46 O	46 O	11,6	O	326	117	46	46	23
47 P	47 P	11,7	P	327	120	47	47	14
50 Q	50 Q	11,8	Q	330	121	50	50	15
51 R	51 R	11,9	R	331	122	51	51	16
22 S	22 S	0,2	S	342	123	22	62	17
23 T	23 T	0,3	T	343	124	23	63	10
24 U	24 U	0,4	U	344	125	24	64	11
25 V	25 V	0,5	V	345	126	25	65	12
26 W	26 W	0,6	W	346	127	26	66	13
27 X	27 X	0,7	X	347	130	27	67	04
30 Y	30 Y	0,8	Y	350	131	30	70	05
31 Z	31 Z	0,9	Z	351	132	31	71	06
12 ß	12 ß	0	0	360	060	12	00	74
01 1	01 1	1	1	361	061	01	01	75
02 2	02 2	2	2	362	062	02	02	76
03 3	03 3	3	3	363	063	03	03	77
04 4	04 4	4	4	364	064	04	04	70
05 5	05 5	5	5	365	065	05	05	71
06 6	06 6	6	6	366	066	06	06	72
07 7	07 7	7	7	367	067	07	07	73
10 8	10 8	8	8	370	070	10	10	64
11 9	11 9	9	9	371	071	11	11	65

TAPE OUTPUT CODES IN OCTAL NOTATION

BURROUGHS	CDC External	Card Punch	KEYBOARD	EBCDIC	NCR ASCII	BCD	HWELL-7	XCL-7
32 Error (—)	32 ≤	0,8,2	≠	152				
20 space	20 space	blank	SP	100	040	20	15	54
72 +	72 ∨ or ∧	12,8,2	¢	112 [$]	(∧)136	72	77	(£)50
73 .	73 .	12,8,3	.	113	056	73	33	42
74 ? --	74)	12,8,4	<	114	074	74	60	60
75 (	75 |	12,8,5	(	115	050	75	74	44
76 <	76 ?	12,8,6	+	116	053	76	20	47
77 | --	77 ;	12,8,7	|	117	(/)134	—	(CR)75	(↑)02
60 &	60 +	12	&	120	046	60	17	52
52 ¦(—ø)	52 % ▲	11,8,2	¦	132	041	52	57	55
53 $	53 $	11,8,3	$	133 [£]	044	53	53	00
54 * --	54 * or ⋈	11,8,4	*	134	052	54	54	46
55)	55 ↑ or ⊓	11,8,5	)	135	051	55	34	45
56 ;	56 ↓ or ⊔	11,8,6	;	136	073	56	32	67
57 ¬	57 delete ⊕	11,8,7	¬	137	(])135	—	(≠)56	(])01
40 - --	40 -	11	-	140	055	40	40	41
21 /	21 /	0,1	/	141	057	21	61	43
33 ,	33 ,	0,8,3	,	153	054	33	73	40
34 %	34 (%	0,8,4	%	154	045	34	35	51
35 = --	35 rej ●	0,8,2	(—)	155	137	35	(□)76	(←)03
36 ≠	36 ▽ or "	0,8,6	>	156	076	36	16	62
37 "	37 ≠ or ∼	0,8,7	?	157	077	37	37	63
00 ¢	00 :		:	172	072	—	14	66
13 #	13 =	8,3	#	173	043 [£]	13	52	57
14 @ --	14 - or △	8,4	@	174	100	14	72	34
15 :	15 :	8,5	'	175	047	15	12	53
16 >	16 ' or ⌟	8,6	=	176	075	16	13	61
17 ' --	17 — l.del.	8,7	"	177	042	17	55	56
Blank (+c)								

COLLATING SEQUENCE
re: ENTREX CHARS.

A-I	4	Spec Char	2
J-R	6	Space	1
S-Z	7	+ø ov'sgn	3
ø-9	8	-ø ov'sgn	5

+&- overpunch

+0=300	-0=320	(+ 0)
+1=301	-1=321	(- 0)
+2=302	-2=322	
+3=303	-3=323	
+4=304	-4=324	
+5=305	-5=325	
+6=306	-6=326	
+7=307	-7=327	
+8=310	-8=330	
+9=311	-9=331	

300, 320 } May be used in place of one of the above legal EBCDIC characters or associated with an unused key.

( ) = Corresponding Character
[ ] = U.K. Version

Deci-mal	Hexa-deci-mal	Instruction Mnemonic (RR Format)	Graphic & Control Symbols (5) BCDIC	Graphic & Control Symbols (5) EBCDIC	7-Track Tape BCDIC	Punched Card Code	System/360 8-bit Code
0	00			NUL		12-0-1-8-9	0000 0000
1	01			SOH		12-1-9	0000 0001
2	02			STX		12-2-9	0000 0010
3	03			ETX		12-3-9	0000 0011
4	04	SPM		PF		12-4-9	0000 0100
5	05	BALR		HT		12-5-9	0000 0101
6	06	BCTR		LC		12-6-9	0000 0110
7	07	BCR		DEL		12-7-9	0000 0111
8	08	SSK				12-8-9	0000 1000
9	09	ISK				12-1-8-9	0000 1001
10	0A	SVC		SMM		12-2-8-9	0000 1010
11	0B			VT		12-3-8-9	0000 1011
12	0C			FF		12-4-8-9	0000 1100
13	0D	BASR(4)		CR		12-5-8-9	0000 1101
14	0E			SO		12-6-8-9	0000 1110
15	0F			SI		12-7-8-9	0000 1111
16	10	LPR		DLE		12-11-1-8-9	0001 0000
17	11	LNR		DC1		11-1-9	0001 0001
18	12	LTR		DC2		11-2-9	0001 0010
19	13	LCR		TM		11-3-9	0001 0011
20	14	NR		RES		11-4-9	0001 0100
21	15	CLR		NL		11-5-9	0001 0101
22	16	OR		BS		11-6-9	0001 0110
23	17	XR		IL		11-7-9	0001 0111
24	18	LR		CAN		11-8-9	0001 1000
25	19	CR		EM		11-1-8-9	0001 1001
26	1A	AR		CC		11-2-8-9	0001 1010
27	1B	SR		CU1		11-3-8-9	0001 1011
28	1C	MR		IFS		11-4-8-9	0001 1100
29	1D	DR		IGS		11-5-8-9	0001 1101
30	1E	ALR		IRS		11-6-8-9	0001 1110
31	1F	SLR		IUS		11-7-8-9	0001 1111
32	20	LPDR		DS		11-0-1-8-9	0010 0000
33	21	LNDR		SOS		0-1-9	0010 0001
34	22	LTDR		FS		0-2-9	0010 0010
35	23	LCDR				0-3-9	0010 0011
36	24	HDR		BYP		0-4-9	0010 0100
37	25	LRDR		LF		0-5-9	0010 0101
38	26	MXR		ETB		0-6-9	0010 0110
39	27	MXDR		ESC		0-7-9	0010 0111
40	28	LDR				0-8-9	0010 1000
41	29	CDR				0-1-8-9	0010 1001
42	2A	ADR		SM		0-2-8-9	0010 1010
43	2B	SDR		CU2		0-3-8-9	0010 1011
44	2C	MDR				0-4-8-9	0010 1100
45	2D	DDR		ENQ		0-5-8-9	0010 1101
46	2E	AWR		ACK		0-6-8-9	0010 1110
47	2F	SWR		BEL		0-7-8-9	0010 1111
48	30	LPER				12-11-0-1-8-9	0011 0000
49	31	LNER				1-9	0011 0001
50	32	LTER		SYN		2-9	0011 0010
51	33	LCER				3-9	0011 0011
52	34	HER		PN		4-9	0011 0100
53	35	LRER		RS		5-9	0011 0101
54	36	AXR		UC		6-9	0011 0110
55	37	SXR		EOT		7-9	0011 0111
56	38	LER				8-9	0011 1000
57	39	CER				1-8-9	0011 1001
58	3A	AER				2-8-9	0011 1010
59	3B	SER		CU3		3-8-9	0011 1011
60	3C	MER		DC4		4-8-9	0011 1100
61	3D	DER		NAK		5-8-9	0011 1101
62	3E	AUR				6-8-9	0011 1110
63	3F	SUR		SUB		7-8-9	0011 1111

NOTES FOR PANELS 11-14

1. Add C (check bit) for odd or even parity as needed, except as noted
2. For even parity use CA
3. Decimal feature
4. Model 67
5. EBCDIC graphics shown are standard bit pattern assignments. For specific print train/chain see printer manual

Decimal	Hexadecimal	Instruction Mnemonic (RX Format)	Graphic & Control Symbols (5) BCDIC	EBCDIC	7-Track Tape BCDIC (1)	Punched Card Code	System 360 8-bit Code
64	40	STH		SP	(2)	no punches	0100 0000
65	41	LA				12-0-1-9	0100 0001
66	42	STC				12-0-2-9	0100 0010
67	43	IC				12-0-3-9	0100 0011
68	44	EX				12-0-4-9	0100 0100
69	45	BAL				12-0-5-9	0100 0101
70	46	BCT				12-0-6-9	0100 0110
71	47	BC				12-0-7-9	0100 0111
72	48	LH				12-0-8-9	0100 1000
73	49	CH				12-1-8	0100 1001
74	4A	AH		¢		12-2-8	0100 1010
75	4B	SH	.	.	B A 8 2 1	12-3-8	0100 1011
76	4C	MH	‡)	<	B A 8 4	12-4-8	0100 1100
77	4D	BAS (4)	[	(	B A 8 4 1	12-5-8	0100 1101
78	4E	CVD	<	+	B A 8 4 2	12-6-8	0100 1110
79	4F	CVB	¢	!	B A 8 4 2 1	12-7-8	0100 1111
80	50	ST	& +	&	B A	12	0101 0000
81	51					12-11-1-9	0101 0001
82	52					12-11-2-9	0101 0010
83	53					12-11-3-9	0101 0011
84	54	N				12-11-4-9	0101 0100
85	55	CL				12-11-5-9	0101 0101
86	56	O				12-11-6-9	0101 0110
87	57	X				12-11-7-9	0101 0111
88	58	L				12-11-8-9	0101 1000
89	59	C				11-1-8	0101 1001
90	5A	A		!		11-2-8	0101 1010
91	5B	S	$	$	B 8 2 1	11-3-8	0101 1011
92	5C	M	*	*	B 8 4	11-4-8	0101 1100
93	5D	D	]	)	B 8 4 1	11-5-8	0101 1101
94	5E	AL	;	;	B 8 4 2	11-6-8	0101 1110
95	5F	SL	∆	¬	B 8 4 2 1	11-7-8	0101 1111
96	60	STD	-	-	B	11	0110 0000
97	61		/	/	A 1	0-1	0110 0001
98	62					11-0-2-9	0110 0010
99	63					11-0-3-9	0110 0011
100	64					11-0-4-9	0110 0100
101	65					11-0-5-9	0110 0101
102	66					11-0-6-9	0110 0110
103	67	MXD				11-0-7-9	0110 0111
104	68	LD				11-0-8-9	0110 1000
105	69	CD				0-1-8	0110 1001
106	6A	AD		:		12-11	0110 1010
107	6B	SD	.	.	A 8 2 1	0-3-8	0110 1011
108	6C	MD	% (	%	A 8 4	0-4-8	0110 1100
109	6D	DD	¥	—	A 8 4 1	0-5-8	0110 1101
110	6E	AW	\	>	A 8 4 2	0-6-8	0110 1110
111	6F	SW	◆	?	A 8 4 2 1	0-7-8	0110 1111
112	70	STE				12-11-0	0111 0000
113	71					12-11-0-1-9	0111 0001
114	72					12-11-0-2-9	0111 0010
115	73					12-11-0-3-9	0111 0011
116	74					12-11-0-4-9	0111 0100
117	75					12-11-0-5-9	0111 0101
118	76					12-11-0-6-9	0111 0110
119	77					12-11-0-7-9	0111 0111
120	78	LE				12-11-0-8-9	0111 1000
121	79	CE		`		1-8	0111 1001
122	7A	AE	§	:	A	2-8	0111 1010
123	7B	SE	# ·	#	8 2 1	3-8	0111 1011
124	7C	ME	@	@	8 4	4-8	0111 1100
125	7D	DE	'	'	8 4 1	5-8	0111 1101
126	7E	AU	>	=	8 4 2	6-8	0111 1110
127	7F	SU	~	"	8 4 2 1	7-8	0111 1111

Deci-mal	Hexa-deci-mal	Instruction Mnemonic (Var. Formats)	Graphic & Control Symbols (5) BCDIC	EBCDIC	7-Track Tape BCDIC	Punched Card Code	System 360 8-bit Code
128	80	SSM				12-0-1-8	1000 0000
129	81			a		12-0-1	1000 0001
130	82	LPSW		b		12-0-2	1000 0010
131	83	(Diagnose)		c		12-0-3	1000 0011
132	84	WRD		d		12-0-4	1000 0100
133	85	RDD		e		12-0-5	1000 0101
134	86	BXH		f		12-0-6	1000 0110
135	87	BXLE		g		12-0-7	1000 0111
136	88	SRL		h		12-0-8	1000 1000
137	89	SLL		i		12-0-9	1000 1001
138	8A	SRA				12-0-2-8	1000 1010
139	8B	SLA				12-0-3-8	1000 1011
140	8C	SRDL				12-0-4-8	1000 1100
141	8D	SLDL				12-0-5-8	1000 1101
142	8E	SRDA				12-0-6-8	1000 1110
143	8F	SLDA				12-0-7-8	1000 1111
144	90	STM				12-11-1-8	1001 0000
145	91	TM		j		12-11-1	1001 0001
146	92	MVI		k		12-11-2	1001 0010
147	93	TS		l		12-11-3	1001 0011
148	94	NI		m		12-11-4	1001 0100
149	95	CLI		n		12-11-5	1001 0101
150	96	OI		o		12-11-6	1001 0110
151	97	XI		p		12-11-7	1001 0111
152	98	LM		q		12-11-8	1001 1000
153	99			r		12-11-9	1001 1001
154	9A					12-11-2-8	1001 1010
155	9B					12-11-3-8	1001 1011
156	9C	SIO				12-11-4-8	1001 1100
157	9D	TIO				12-11-5-8	1001 1101
158	9E	HIO				12-11-6-8	1001 1110
159	9F	TCH				12-11-7-8	1001 1111
160	A0					11-0-1-8	1010 0000
161	A1			~		11-0-1	1010 0001
162	A2			s		11-0-2	1010 0010
163	A3			t		11-0-3	1010 0011
164	A4			u		11-0-4	1010 0100
165	A5			v		11-0-5	1010 0101
166	A6			w		11-0-6	1010 0110
167	A7			x		11-0-7	1010 0111
168	A8			y		11-0-8	1010 1000
169	A9			z		11-0-9	1010 1001
170	AA					11-0-2-8	1010 1010
171	AB					11-0-3-8	1010 1011
172	AC					11-0-4-8	1010 1100
173	AD					11-0-5-8	1010 1101
174	AE					11-0-6-8	1010 1110
175	AF					11-0-7-8	1010 1111
176	B0	STMC (4)				12-11-0-1-8	1011 0000
177	B1	LRA (4)				12-11-0-1	1011 0001
178	B2					12-11-0-2	1011 0010
179	B3					12-11-0-3	1011 0011
180	B4					12-11-0-4	1011 0100
181	B5					12-11-0-5	1011 0101
182	B6					12-11-0-6	1011 0110
183	B7					12-11-0-7	1011 0111
184	B8	LMC (4)				12-11-0-8	1011 1000
185	B9					12-11-0-9	1011 1001
186	BA					12-11-0-2-8	1011 1010
187	BB					12-11-0-3-8	1011 1011
188	BC					12-11-0-4-8	1011 1100
189	BD					12-11-0-5-8	1011 1101
190	BE					12-11-0-6-8	1011 1110
191	BF					12-11-0-7-8	1011 1111

Decimal	Hexadecimal	Instruction Mnemonic (SS Format)	Graphic & Control Symbols (5) BCDIC	EBCDIC	7-Track Tape BCDIC (1)	Punched Card Code	System/360 8-bit Code
192	C0		?	{	B A 8 2	12-0	1100 0000
193	C1		A	A	B A 1	12-1	1100 0001
194	C2		B	B	B A 2	12-2	1100 0010
195	C3		C	C	B A 2 1	12-3	1100 0011
196	C4		D	D	B A 4	12-4	1100 0100
197	C5		E	E	B A 4 1	12-5	1100 0101
198	C6		F	F	B A 4 2	12-6	1100 0110
199	C7		G	G	B A 4 2 1	12-7	1100 0111
200	C8		H	H	B A 8	12-8	1100 1000
201	C9		I	I	B A 8 1	12-9	1100 1001
202	CA					12-0-2-8-9	1100 1010
203	CB					12-0-3-8-9	1100 1011
204	CC			J		12-0-4-8-9	1100 1100
205	CD					12-0-5-8-9	1100 1101
206	CE			V		12-0-6-8-9	1100 1110
207	CF					12-0-7-8-9	1100 1111
208	D0		!	}	B 8 2	11-0	1101 0000
209	D1	MVN	J	J	B 1	11-1	1101 0001
210	D2	MVC	K	K	B 2	11-2	1101 0010
211	D3	MVZ	L	L	B 2 1	11-3	1101 0011
212	D4	NC	M	M	B 4	11-4	1101 0100
213	D5	CLC	N	N	B 4 1	11-5	1101 0101
214	D6	OC	O	O	B 4 2	11-6	1101 0110
215	D7	XC	P	P	B 4 2 1	11-7	1101 0111
216	D8		Q	Q	B 8	11-8	1101 1000
217	D9		R	R	B 8 1	11-9	1101 1001
218	DA					12-11-2-8-9	1101 1010
219	DB					12-11-3-8-9	1101 1011
220	DC	TR				12-11-4-8-9	1101 1100
221	DD	TRT				12-11-5-8-9	1101 1101
222	DE	ED (3)				12-11-6-8-9	1101 1110
223	DF	EDMK (3)				12-11-7-8-9	1101 1111
224	E0		+	\	A 8 2	0-2-8	1110 0000
225	E1					11-0-1-9	1110 0001
226	E2		S	S	A 2	0-2	1110 0010
227	E3		T	T	A 2 1	0-3	1110 0011
228	E4		U	U	A 4	0-4	1110 0100
229	E5		V	V	A 4 1	0-5	1110 0101
230	E6		W	W	A 4 2	0-6	1110 0110
231	E7		X	X	A 4 2 1	0-7	1110 0111
232	E8		Y	Y	A 8	0-8	1110 1000
233	E9		Z	Z	A 8 1	0-9	1110 1001
234	EA					11-0-2-8-9	1110 1010
235	EB					11-0-3-8-9	1110 1011
236	EC			#		11-0-4-8-9	1110 1100
237	ED					11-0-5-8-9	1110 1101
238	EE					11-0-6-8-9	1110 1110
239	EF					11-0-7-8-9	1110 1111
240	F0		0	0	8 2	0	1111 0000
241	F1	MVO	1	1	1	1	1111 0001
242	F2	PACK	2	2	2	2	1111 0010
243	F3	UNPK	3	3	2 1	3	1111 0011
244	F4		4	4	4	4	1111 0100
245	F5		5	5	4 1	5	1111 0101
246	F6		6	6	4 2	6	1111 0110
247	F7		7	7	4 2 1	7	1111 0111
248	F8	ZAP (3)	8	8	8	8	1111 1000
249	F9	CP (3)	9	9	8 1	9	1111 1001
250	FA	AP (3)		|		12-11-0-2-8-9	1111 1010
251	FB	SP (3)				12-11-0-3-8-9	1111 1011
252	FC	MP (3)				12-11-0-4-8-9	1111 1100
253	FD	DP (3)				12-11-0-5-8-9	1111 1101
254	FE					12-11-0-6-8-9	1111 1110
255	FF					12-11-0-7-8-9	1111 1111

MODULE REVISION LEVELS

Date: May 16, 1975

Subject: F.C.O. & REV. LEVEL HISTORY

The following is a list of minimum board revisions for use in the field. Second column shows mfg. current rev. installed in new systems being shipped.

		MFG.
0228-002 DCC CPU	REV L	M
0240-002 DGC CPU	REV B	B
0127-001 8K MEM	REV N	N+1470
1391-001 8K MEM	REV M	M
2085-001 16K MEM	REV A	
1570-001 Scanner	REV P	P
1451-001 Scanner	REV K	K
0107-001 Disk 20	REV P	T
0887-003 Comm. Controller	REV D	F
1077-001 Printer Controller	REV F	
1445-001 Printer Controller	REV J	J
1073-001 7 CH Tape Controller	REV O	C
1070-001 9 CH Tape Controller	REV L	L
1404-xxx 9 CH Tape Controller	REV J	J
1074-001 1600 BPI Tape Controller	REV G	H
1421-001 1600 BPI Tape Controller	REV H	H
1085-007 Pertec Formatter	REV A	
0232-004 Jumbo DGC	REV L	
0229-002 Jumbo DCC	REV M	
1886-001 Jumbo DCC (480A)	REV F	

1651-001	Term 4 bd.	REV K
1203-001	Terminal Pr.	REV F
1401-001	" "	REV F
0635-001	Tresco P.S.	REV F
0823-001	Elasco P.S.	REV D
0185-xxx	R.T.A. logic bd.	REV M
2015-xxx	Bucode Tape Drive	REV E
0241-001	Centronics Printer	REV C
0773-001	DCC Upper P.S.	REV D
0774-001	DCC Lower P.S.	REV D

Also enclosed you will find a list of FCO'swritten with their associated revision level.

When an FCO is performed be sure to label with Brady markers both the reinforcing bar & the board itself, preferably over any prior revision label. The Brady markers are available in the Regional Office.

Any questions should be referred to your Regional Specialist.

NOTE: Any board with a revision lower than shown in Revision Level History should be recycled through Burlington for updating.

FCO's as of 3/25/75

PART #	GROUP	FCO	REV
0228 DCC	PCSSR	00001	E
"	"	00002	F
"	"	00004	H
"	"	00005	L -
0240 DGC	PCSSR	00002	B -
0127	8K MEM	00001	M
"	" "	00002	M DOC. ONLY
"	" "	00003	N -
1391	8K MEM	00001	G
"	" "	00002	G DOC. ONLY
"	" "	00003	H -
2085	16K MEM	00001	A -
1570	Scanner	00001	L
"	"	00003	M -
1451	Scanner	00002	G
"	"	00003	H -
0107	Disk 20	00001	I
"	"	00002	L
"	"	00003	P
"	"	00004	R-
0887	CONSR	00001	HARNESS WIRING
"	"	00002	D-

FCO's as of 3/25/75

PART #	GROUP	FCO	REV
0241	CENTR	00001	B
"	"	00002	C -
0773 (DCC UPPER)	DCCPS	00001	B
"	"	00002	C
"	"	00003	D -
0774 (DCC LOWER)	DCCPS	00001	B
"	"	00002	C
"	"	00003	D -
N/A	PROBE	00001	A -
0781	DESKS	00001	A -

FCO's as of 3/25/75

PART #	GROUP	FCO	REV
1077	Print	00001	F -
1445	Print	00001	I
"	"	00002	J -
1073	7 TAPE	00001	JUMBO WIRIN
"	" "	00002	N
"	" "	00003	O -
1070	9 TAPE	00001	L -
1404	9 TAPE	00001	J -
1074	16 TAPE	00001	E
"	" "	00002	G -
1421	16 TAPE	00001	H
"	" "	00002	F -
1085	FMTTR	00001	A -
0229 (DCC)	JUMBO	00001	K
"	"	00002	L
"	"	00003	M -
1886	JUMBO	00004	F -
1651	TERM 4	00001	D
"	"	00002	G
"	"	00003	K -

FCO's as of 3/25/75

PART #	GROUP	FCO	REV
* 1203	TERML	00001	A
"	"	00002	B
"	"	00003	C
"	"	00004	D
"	"	00005	E
"	"	00006	F-
* 1401	TERML	00001	A
"	"	00002	B
"	"	00003	C
"	"	00004	D
"	"	00005	E
"	"	00006	F-
0635	TEMPS	00002	F-
0823	TEMPS	00001	C
"	"	00003	D -
0185	RTAPT	00001	G
"	"	00002	H
"	"	00003	I
"	"	00004	K
"	"	00005	L
"	"	00006	M -
2015	BUCDE	00001	A
"	"	00002	B
"	"	00003	C
"	"	00004	D
"	"	00005	E -

* REV'S ARE FOR PAIR REVISION

PREVENTIVE MAINT

All reference pages refer to pages in data printer manual.

		Monthly	Quarterly	Semi-Annual	Annual
Data Printer:	Clean the following: Paper dust accumulation	x			
	Inspect and clean filters	x			
	Check the following: Control panel switches	x			
	for proper operation.	x			
	Vertical print alignment adjust hammer	x			
	flight time if required (Ref. Pg. 5-17)	x			
	Check yoke interlocks switches for proper		x		
	operation (Ref. Pg. 5-40)		x		
	Yoke latch switch for proper operation		x		
	(Ref. Pg. 5-40)		x		
	Paper low switch for proper operation		x		
	(Ref. Pg. 5-26)		x		
	Check ribbon tension (Ref. Pg. 5-65)		x		
	Ribbon tracking solenoids (Ref. Pg. 5-60)		x		
	Ribbon edge sensing switch (Ref. Pg. 5-60)		x		
	Seating of P.C. Boards			x	
	Check all connectors for secure connections			x	
	Check accumulation of residue in clutch/brake			x	
	cannister			x	
	"Do not empty" replace assy. when full (Ref.			x	
	Pg. 5-87)			x	
	Check fire pulse amplitude and duration adjust			x	
	(Ref. Pg. 5-28)			x	
	Check reluctence pick-up outputs, adjust as			x	
	required (Ref. Pg. 5-30)			x	

All reference pages refer to pages in data printer manual.

		Monthly	Quarterly	Semi-Annual	Annual
Data Printer:	Check VFU for proper positioning (Ref. Pg. 5-39)			x	
	Check sequencer for proper operation (Ref. Pg. D-65)			x	
	Check all fans for proper operation			x	
	Check tension and condition of all belts (Ref. Pg. 5-44, 45, 53 and 54)			x	
	Check lubrication pts. clean and re-lubricate as required (Ref. Pg. 5-14)				x
	Check for loose fasteners, frayed wires and excessively worn parts-replace as required				x
					x

*Reference are to Series 100 Preventive Maintenance Procedures from Centronics

		Monthly	Quarterly	Semi-Annual	Annual
Centronics Printer:	Clean the following:				
	Timing fence clean and proper gap between optics and fence *(Pg. 2 # 1)	x			
	Carriage guide bar *(Pg. 2 # 2)	x			
	Proper tension on main motor drive belt* (Pg. 6 # 6)			x	
	Smooth carriage motion *(Pg. 2 # 2)		x	x	
	No loose switches				x
	Rubber stop on damper not loose or excessively worn *(Pg. 2 # 2)			x	
	Back stop pawl spring in place, not loose *(Pg. 4 # 4)			x	
	Check for proper gap of forward/reverse clutch *(Pg. 6 # 6)			x	x
	Pin alignment of paper feed tractor units (Ref. to Centronics Manual Pg. 8-9)			x	x
	Pin belt tension (Centronics Manual Pg. 8-9)			x	
	VFU paper tape assy. properly aligned			x	
	No binding of carriage stopper lever		x		
	Smooth operation of line feed clutch			x	
	Top of forms relay works smoothly (See Help Bulletin # 48)	x x			

*Reference are to Series 100 Preventive Maintenance Procedures from Centronics

		Monthly	Quarterly	Semi-Annual	Annual
Centronics Printer:	Clean print head with Freon *(Pg. 3 # 3)				x
	Oil cam assy.			x	
	Check all gears for wear and proper mesh				x
	Check for proper ribbon tracking *(Pg. 4 # 5)		x		
	Check for proper ribbon reversal (Centronics			x	
	Manual Pg. 1-12)			x	
	Grease all metal to metal moving surfaces				x
	Check copper ribbon cable for cracks, replace			x	
	if necessary			x	
	Check front door interlock switch for proper		x		
	operation		x		
	Check for proper voltages +12V and -12V			x	
	(Centronics Manual Pg. 6-13)			x	
	+5V and +30V (Centronics Manual Pg. 6-12)			x	
	Vacuum out any loose paper or paper dust	x			
	Run Printer Diagnostic-1 pass	x			

		Monthly	Quarterly	Semi-Annual	Annual
Diablo:	Clean the following: Disk Heads, Spindle,	x			
	Disk Filter (vacuum only)	x			
	Check the following: Clamp holding boards	x			
	in place and secure	x			
	Cable conn. on J10 board, cable should be	x			
	secured on housing, small clamp	x			
	Scratches on Disk Pack	x			
	Damage to either upper or lower head	x			
	Voltage on Dynage Power Supply +15V ± .10V;	x			
	-15V ± .10V	x			
	Replace foam pad in Diablo Filter			x	
	Replace complete Diablo Filter				x
	Check alignment of zero stop adjust				x
	Check that heads load together				x
	Runs Disk Diagnostic-10 passes	x			
	Run Disk Acceptance 1 pass of "Pass 3"	x			
	worst case pattern (Ref. Help Bulletin # 36A)	x			
	Run Disk Acceptance 3 complete passes worst case			x	
	pattern (Ref. Help Bulletin # 36A)			x	

		Monthly	Quarterly	Semi-Annual	Annual
Pertec:	Clean the following: Tape Cleaner; all Rollers;	x			
	Tape Head	x			
	Check and adjust if necessary the following:	x			
	Tape Speed (Ref. Pertec Manual Pg. 6-21)	x			
	Read Skew (Ref. Pertec Manual Pg. 6-48)		x		
	Read Amplitudes (Ref. Pertec Manual Pg. 6-30)		x		
	Write Skew (Ref. Pertec Manual Pg. 6-44)		x		
	All connectors secure	x			
	EOT/BOT adjustments (Ref. Pertec Manual	x			
	Pg. 6-11)	x			
	Check voltages (Ref. Pertec Manual		x		
	Pg. 6-8 and 6-9)		x		
	Formatter adjustments: voltage on P.E. Write	x			
	or P.E. Read (Ref. Help Bulletin # 42)	x			
	Timing of fixed and tracking oscillators	x			
	(Ref. Help Bulletin # 42)	x			
	Check the following: Head Wear (Ref. Pg. 6-49			x	
	Pertec Manual)			x	

		Monthly	Quarterly	Semi-Annual	Annual
Bucode:	Remove tape cleaner empty if necessary.	x			
	Check and perform steps 1-15 of Alignment	x			
	Procedure Pg. 29-41 of Reference Manual	x			
	Run Tape Diagnostic and Tape acceptance	x			
	Tests-1 pass each	x			
	Check head for wear see Help Bulletin # 34			x	

		Monthly	Quarterly	Annual	Annual
Data Scope:	Clean the following: Inside of Terminal (vacuum)	x			
	Housing and Screen	x			
	Monitor Screen	x			
	Check the following: all cables for loose or broken connectors	x			
	Monitor Screen for proper intensity and clarity	x			
	Voltages from power supply	x			
	Keyswitches for proper operation	x			

		Monthly	Quarterly	Semi-Annual	Annual
Jumbo:	Check all voltages per Page 9 of Ref. Manual	x			
	Check voltages at Perterm Cage +5V ± .25V; -5V ± .25V	x			
	Run following diagnostic: SYSD1, Mem Exercisor (2 min ea); Mem06 Adr and S1.1/00 (10 min. ea).	x			
	ARITHM-5 passes; powerfail	x			
	Check all front panel lights, pg.10-5,item 4		x		
	Clean main system filter			x	
	Check all cables for frayed or broken wires			x	
	Check all cables for secure connections	x		x	
	Check all power supply voltages (Ref. Help Bulletin # 37A, and F.E.Ref. pg. 1-13				
	Check and clean if necessary all board contacts- use Freon				

Refer also to pg. 15-10.

Preventive Maintenance Check List	
Item	**Check**
Mechanical Connections	1. that all screws are tight and that all mechanical assemblies are secure.
	2. that all crimped lugs are secure and properly inserted onto their mating connectors.
Wiring and Cables	1. all wiring and cables for breaks, cuts, frayed leads, or missing lugs.
	2. wire wraps for broken or missing pins.
	3. that no wires or cables are strained or cramped.
	4. that cables do not interfere with doors, and that they do not chafe when doors are opened and closed.
Air Filters	all air filters for cleanliness and for normal air movement through cabinets.
Modules and Components	1. that all modules are properly seated. Look for areas of discoloration and all exposed surfaces.
	2. all exposed capacitors for signs of discoloration, leakage, or corrosion.
	3. power supply capacitors for bulges.
Indicators and Switches	all indicators and switches for tightness, check for cracks, discoloration, or other visual defects.
Fans	for broken fan blades.
Diagnostics	run all diagnostics periodically

SERVICE GIUDE

CHIP REPLACEMENT

A. Clip leads - Component side.
B. Solder suck - P.C. side.
C. Loosen and remove leads.
D. Brush (dry) to clean.
E. Form I.C. leads and insert.
F. Slightly bend two leads on opposite corners and tack.
G. Heat junction most opposite last junction soldered and the I.C. lead, til solder flows freely. Get iron off immediately so not to damage. Clean and re-tin tip before soldering each pin to allow the chip more time to cool and provide a more efficient heating surface. Do steps G&H all leads.
H. Inspect component side to verify that solder has flowed through the eyelets and onto I.C. leads.
I. Cut tips off leads if they protrude on P.C. side.
J. Clean P.C. and component sides of board with alcohol squeezed from TEXWIPE and brush.
K. Inspect and repair any scratches or inadequate solder junctions.

WIRE-WRAP

A. Strip 5/8 inch of wire (30 ga., usually).
B. Premeasure if six inches, or less.
C. Insert wire 1 inch into outer hole on wrap tool.
D. Insert tool, via center hole, over post to limit.
E. Hold lead in direction it is to travel with long nose pliers.
F. Wrap firmly in clockwise direction, letting wrap evenly force the wrap tool up the post, until no further movement of the tool results.
G. Remove the tool from the post and crimp top wrap, rotating <u>slightly</u> clockwise, to make grip firm.
H. When un-wrapping, rotate the unwrap tool only a few turns, then complete the unwrapping very carefully with a pair of long needlenose pliers.
I. Always inspect the area near that post and the bottom plate below it for small turns of wire which may have been broken off, in every case.

Date: 2/28/75, Amended
To: All holders of ENTREX Field Engineering Ref., 02083.
From: Training and Technical Publications, Art Bain
Subject: Use of Sections 4,5,6; Errata not affected by later updates.

It is recommended that you use the vendor manual with the tape adjustment sections, the first time you make adjustments on a particular model drive.

In Section 5, you should note that NRZI ONLY drives use pages 5--1-17, PE ONLY drives use 5--1-9 & 5--18-21, and DUAL DENSITY drives use 5--1-9 & 5--21-24. This entire section will be revised to separate procedures for 8B, 10 NRZI, and for 10PE drives, in the future. There is useful information on tape formats on pages 5--25-27.

In Section 6, cross-references between the 6640 manual, p/n 02066, and the 6X40 & 6X60 manual, are on page 6--23. The 6X40 & 6X60 manual has no Data F print. There is tape format info on page 6--29.

The procedures columns in chapters 5 & 6 refer to vendor manual paragraphs in the adjustments sections.

Errata:
pg. 1--7, Add device codes: 16 CDR Card Reader
21 REI Interface
37 OCR ODP Interface
pg. 4--2, Add note above item 6: Item 10, pg. 4--7, should be checked or adjusted at this point. para. A, change RPM to RMP.
pg. 4--4, bottom line, delete only the letter "C.".
pg. 4--5, Change item D to read: EXAM memory location Ø with CP switches.
pg. 4--7, Add note at the top of the page: Item 10 should be done before item 6, pg. 4-2.
pg. 4--11, Item 14, step A, change period to comma and add: and turn delay pots (table below) to fully counter-clockwise position. In step C, add note in parenthesis at end of step: (latest channel).

Date: 3/7/75, Amended
To: Holders of the Field Engineering Ref. Manual, 02083
From: Training and Technical Publications
Subject: Rev. packet 3/7/75, and re-printing of errata which has not been corrected by updates.

Packet contains pages 2--4-6 and 15-Ø.A, and may be ordered from this department by memo.

Errata:
pg, 2-3, top table, in bottom box, add or change note as follows: For more complete data, refer to pages 2--4, 5, and 6.
pg. 5-1, bottom line, change to read: Refer to page 5-41 (vice 5-40) and HELP Bulletin 69.
pg. 5-6, bottom box, remarks column, add following: Alternate method: Scope at .1v/div, and 20 or 50usec/div. Using table 6,7,8, or 10 for appropriate Rd. Ampl. Gain test points, reading Master Alignment Tape, adjust speed pot for 100 usec, leading edge to leading edge (9/800).
pg. 5-7, top box, remarks column, item 3, add note: HF reject, 2 or 5 usec/div..
pg. 5-13, top box, remarks col., line 2, add: LF reject.
pg. 5-13, bottom box, remarks col., item 3, add: (Refers to scope channel, not to track on tape.).
pg. 5-16, test points col., 2nd box from bottom, should read: TP105-905/8B.

Field use of binder from previous edition, 01775:
This binder should be held for future use as Field Engineering Diagnostics Manual, 01775-002.

Date: 7/3/75
To: Holders of Field Engineering Ref. Manual, 02083
From: Art Bain, Training and Technical Publications
Subject: F.E. Ref. Manual Update; Issue of Field Engineering Diagnostics Manual, 01775-002

Please place, or remove and replace, as needed, the enclosed packet of update pages into your Reference Manual. A list of affected pages follows:
Pgs. 1--15-16, 8--5-12, 11--Ø.A-7, 12--15-16, 13--9-15, 14--1-6, 15--9-10, and 16--1-12; also Chap 10, except 10--13-14.

Please remove pages 9--1-110.A. These pages have been re-issued as the Field Engineering Diagnostics Manual p/n 01775-002. The old F.E. Ref. Manual binder, p/n 01775-003, holds the new 4 ¼ X 7 ¼ inch diagnostics pages. This binder will be issued to recent new-hires with the manual, however others will need to request the binder by memo, via this department.

Chapter 9 will be re-issued at a later time for Disk Drive information and adjustments.

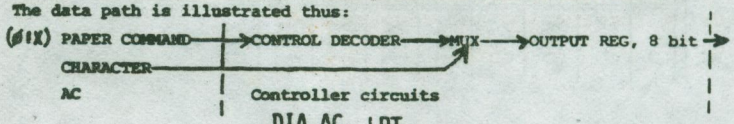
LINE PRINTERS

PROGRAM TO PRINT "ENTREX", CGE. RET., AND LINE FEED ON PRINTER

Load in Location	Mnemonic	Octal Code	Load into location
100	IORST	062677	ø 17777ø = -8
101	LDA,1,ø	024000	1 øøø1ø5 = E
102	SKPBZ,17	063517	2 øøø116 = N
103	JMP.-1	000102	3 øøø124 = T
104	LDA ø,@2ø	022020	4 øøø122 = R
105	MOVø,ø,SZR	101004	5 øøø1ø5 = E
106	JMP .+10	000116	6 øøø13ø = X
107	INC 1,1,SZR	125404	7 øøøø12 = LF
110	JMP.+3	000113	10 øøøø15 = CR
111	HALT	063077	11 000000
112	LDA 1,ø	024000	20 000000
113	SUB ø,ø	102400	
114	STA ø,20	040020	
115	JMP .-11	000104	
116	DOAS ø,17	061117	
117	JMP .-15	000102	

DOAS AC, LPT

All characters and paper commands are output from the selected AC, bits 8--15, one character at a time until line full or CGE. RET.. The data path is illustrated thus:



DIA AC, LPT

Bit 15 is checked for READY status (On-line and $\overline{\text{BUSY}}$). This is sometimes checked by using SKPBZ or SKPDN instruction instead of the DIA.

MSKO DOB AC, CPU

MSKO with bit 12 of the specified AC set allows interupt on DONE.

INTA DIB AC, CPU

Calls the device code of the interupting device to the specified AC.

EDGE CONNECTOR JUMPERS

CENTRONICS: D-16 to D-T and D-18 to D-V
Data Printer: D-19 to D-W and D-25 to D-C

USASCII CODE CHART

For Line Printer

X=	0	1	2	3	4	5	6	7	
04X	BLANK △	! |	" "	#	$ ⚷	% %	&	' ¬	1-8
05X	({	) }	*	+	, ¬	-	.	/	9-16
06X	0	1	2	3	4	5	6	7 _	17-24
07X	8	9	:	;	<	=	>	? ?	25-32
10X	@	A	B	C	D	E	F	G	33-40
11X	H	I	J	K	L	M	N	O	41-48
12X	P	Q	R	S	T	U	V	W	49-56
13X	X	Y	Z	[	\ ◇	]	^ ↑	_ ← ♡	57-64
01X			PF LINE FEED		FF FORM FEED	CR CGE RET			Drum Posit.

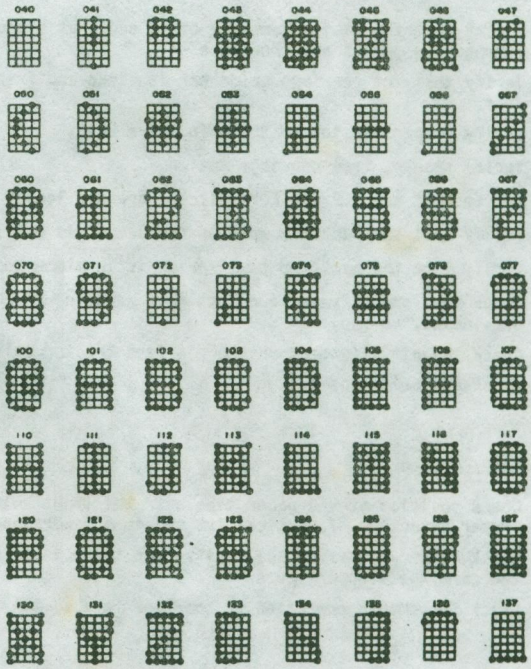
OCR OR OTHER OPTIONS ARE DRAWN TO RIGHT OF BOX.

```
Ø/ DOC Ø, CPU       063077    Halt; Set char./funct. to DS
1/ DIA Ø, CPU       060477    Continue
2/ DOAS Ø; LPT      061117
3/ SKPBZ            063517
4/ JMP .-1          000777
5/ JMP .-4          000774
```

Above program allows scoping data/funct. between LPT and controller data register.

CENTRONICS
MODEL 101 & 101A PRINTERS

STANDARD 5 x 7
CHARACTER MATRIX



CENTRONICS
SERIES 100 PRINTERS
SERVICE GUIDE

The following information is intended to aid service personnel in developing good service procedures and troubleshooting techniques on any of Centronics' Series 100 printers.

When servicing the printer for any reason, a brief inspection and verification of the printer areas described below, may well prevent potential failures in the future.

To perform this inspection, it is only necessary to open, not remove, the printer covers.

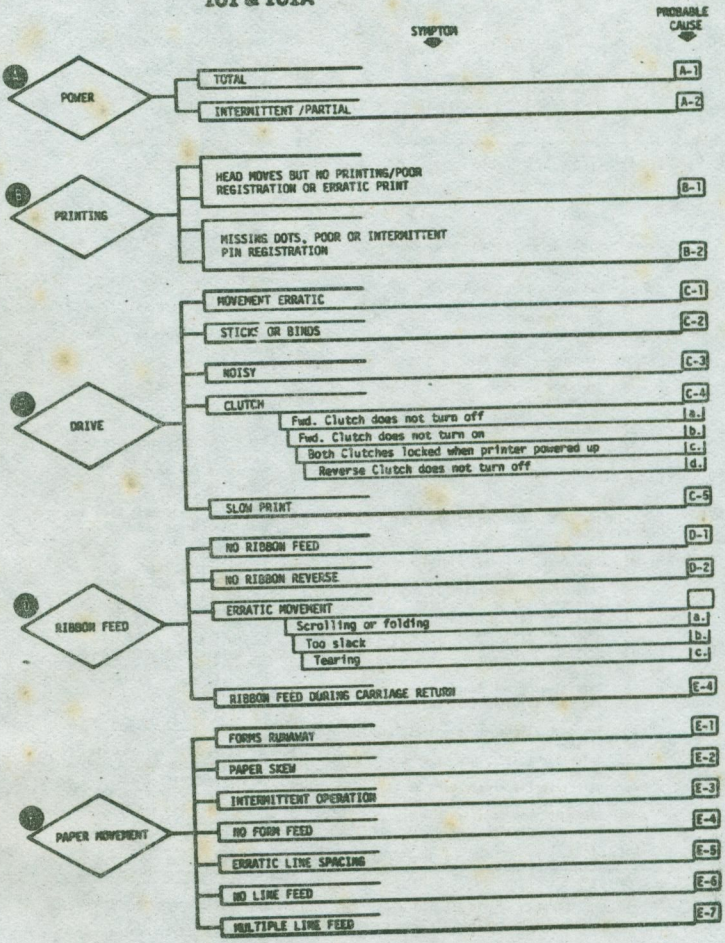
With printer power off:

1. Verify that the timing fence is clean and that a proper gap exists between the optics and the fence.
2. Verify that the carriage guide bar is clean and free of caked on dirt.
3. Verify proper tension on the main drive belt.
4. Verify smooth, free carriage motion.
5. Verify that the RTP and EOP switches are not loose.
6. Verify that the rubber bumper on the damper is not loose.
7. Verify that the backstop pawl spring is in place and not loose.
8. Check the forward/reverse clutch gap. (The newer 102A units are pre-loaded, no-gap).
9. Check the pin alignment on the pin-feed tractor units.
10. Check pin-belt tension.

With printer power on:

11. Check position of VFU paper tape over the light holes to insure proper detection of vertical tab and form feed signals.
12. Check damper operation and verify that there is no binding of the carriage stopper lever.
13. Check for smooth operation of the line feed clutch.

PRINTER MALFUNCTION
MODEL
101 & 101A



A. POWER

A-1 TOTAL

1. Damaged power cord.
2. Open AC line fuse (F4).
3. Open +5V supply fuse (F1).

A-2 INTERMITTENT - PARTIAL

1. Defective +5V regulator.
2. Defective +12V regulator.
3. Defective 30V unregulated supply.
4. Improper AC line voltage.

B. PRINTING

B-1 HEAD MOVES BUT NO PRINTING/POOR REGISTRATION OR ERRATIC PRINT

1. Dirty or defective timing fence.
2. Optic bundle out of adjustment.
3. Improper head position.
4. Defective Video Amplifier.
5. Defective Ribbon Cable.
6. Defective optics lamp or lamp holder.
7. Dirty board or cavity connectors.
8. Improper alignment of timing fence to optic slit.
9. Improper alignemnt of optics lamp filament.
10. Defective safety switch.
11. Improper main belt tension.
12. Defective ±12V regulator.
13. Defective +5V regulator.
14. Defective Electronics Card No. 2.

B-2 MISSING DOTS, POOR OR INTERMITTENT PIN REGISTRATION

1. Improperly aligned, dirty or damaged timing fence.
2. Defective damper assembly.
3. Defective RTP or EOP switch.
4. Defective safety switch.
5. Defective Video Amplifier.
6. Defective Ribbon Cable.
7. Dirty head connector or board contacts.
8. Defective Driver Board.
9. Improper adjustment of optic bundle.
10. Improper alignment of optics lamp filament.
11. Defective optics lamp or lamp holder.
12. Defective Electronic Card No. 1.
13. Defective Electronic Card No. 2.
14. Improper head position.
15. Improper adjustment of print head solenoid.

C. DRIVE

C-1 CARRIAGE MOVEMENT ERRATIC

1. Gap on forward clutch not uniform.
2. Loose main drive belt.
3. Spring drum unwound or broken.
4. Main drive belt touching driver board cables.
5. Defective bushings.
6. Worn or missing teeth on main timing belt.
7. Defective RTP switch.
8. Defective motor pulley.
9. Improperly adjusted motor clutch plate.
10. Intermittent cover interlock switch.
11. Defective drive pulleys or gears.

C-2 CARRIAGE STICKS OR BINDS

1. Fiber optics bundle touching timing fence.
2. Drive belt too tight.
3. Clutch assembly and brackets too tight.
4. Improper forward clutch gap.
5. Spring drum too tight.
6. Reverse clutch not releasing.
7. Restrict ribbon drive.

C-3 NOISY

1. Belts too tig
2. Belt idler w rubbing against casting.
3. Improperly adjusted intermediate pulley.
4. Worn intermediate shaft or bushings.
5. Corroded clutch rotors or armature.
6. Poorly lubricated spring drum.

C-4 CLUTCH

C-4A Forward Clutch Does Not Turn Off

1. Defective EOP switch.
2. Defective Driver Board.
3. Defective Electronic Card No. 1.
4. Defective Electronic Card No. 2.
5. Improper clutch gap.
6. No video signal.
   a. Defective Video Amplifier.
   b. Defective optics lamp or socket.
   c. Defective ribbon cable.
   d. Improperly adjusted fiber optics.
   e. Defective Electronic Card No. 2 video return line.
   f. Dirty timing fence.

C-4B Forward Clutch Does Not Turn On

1. Defective -12V supply fuse, F3.
2. Improper clutch gap.
3. Defective Driver Board.
4. Defective Electronic Card #2.
5. Dirty board connectors.
6. Improper clutch gap.

C-4C Both Clutches Locked When Printer Powered Up

1. Improperly seated electronic boards.
2. Defective Driver Board.
3. Defective Electronic Card No. 2.

C-4D Reverse Clutch Does Not Turn Off

1. Defective RTP switch (check continuity to cavity).
2. Defective Driver Board.
3. Defective Electronic Card No. 1.
4. Defective Electronic Card No. 2.
5. Improper clutch gap.
6. Dirty board or cavity connectors.

System Mera 9150